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AD
RDTE PROJECT NO. 1X141807D174
USATECOM PROJECT NO. 4-6-0500-01
USAASTA PROJECT NO. 66-06

**ENGINEERING FLIGHT TEST
AH-1G HELICOPTER (HUEYCOBRA)**

PHASE D

PART 1

HANDLING QUALITIES

FINAL REPORT

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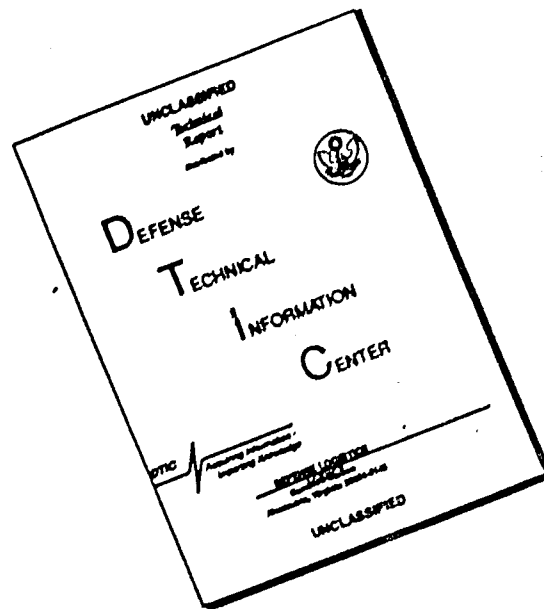
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DECEMBER 1970

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**US ARMY AVIATION SYSTEMS TEST ACTIVITY
EDWARDS AIR FORCE BASE, CALIFORNIA 93523**

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ABSTRACT

The Phase D, Part 1 airworthiness and qualification handling qualities tests of the AH-1G helicopter were conducted at Edwards Air Force Base, California, and auxiliary test sites during the period 13 June 1968 through 29 July 1969. Handling qualities were quantitatively evaluated to determine model specification compliance and to obtain mission suitability information for inclusion in technical manuals and other publications. The AH-1G met all contractual requirements of MIL-H-8501A except for paragraphs 3.2.4 (cyclic force gradients), 3.2.7 (cyclic breakout forces), 3.5.4.1 (take-off and landing in winds), 3.5.5 (autorotational entry) and 3.5.5.1 (aircraft reaction to engine failure). Tests were not conducted to verify compliance with paragraphs 3.5.4.3 (autorotational landings), 3.5.4.4 (autorotational landings) and 3.5.4.5 (autorotational landing with flotation gear) of MIL-H-8501A. By contractual agreement, the handling qualities requirements presented in paragraphs 3.3 (directional and lateral handling qualities) and 3.6 (handling qualities during instrument flight) of MIL-H-8501A were not applicable. The handling qualities of the AH-1G are acceptable throughout the flight envelope except for the four deficiencies for which correction is mandatory for mission accomplishment: excessive cyclic control breakout forces; inadequate directional control; inability to achieve maximum tail rotor blade angle (19 deg) when full left directional control is applied for all conditions with the present directional control/yaw SCAS geometry; and excessive tail rotor horsepower required for hovering and translational flight. In addition, there were five shortcomings for which corrective action is desirable.

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INTRODUCTION

BACKGROUND

1. In October 1965, the Department of the Army directed the US Army Materiel Command (USAMC) to conduct an expedited comparative evaluation of a selected group of three helicopters to fulfill the immediate requirement for an armed helicopter. A flight test program was conducted on the three aircraft by the US Army Aviation Systems Test Activity (USAASTA) at Edwards Air Force Base (AFB), California, from 13 November to 1 December 1965. The AH-1G Huey-Cobra was the aircraft selected from the evaluation to meet this requirement.

2. On 17 August 1966, USAASTA was directed by the US Army Test and Evaluation Command (USATECOM) to perform Phase B and Phase D testing of the AH-1G helicopter (ref 1, app 1). A test plan for the Phase B engineering test was submitted by USAASTA in April 1967 and approved by the US Army Aviation Systems Command (USAAVSCOM). Phase B tests were conducted at different test sites and geographical locations from 3 April 1967 to 3 May 1968 utilizing several aircraft. The results of these tests are contained in references 2 through 8. The test plan for the Phase D program (ref 9) was initially submitted in August 1967 and was approved by USAAVSCOM on 24 October 1968. The Phase D plan of test was amended on 5 November 1968 (ref 10) to include an additional test requested by USAAVSCOM. Two aircraft were used for the Phase D test program to reduce the calendar time. One of the test aircraft was a prototype (aircraft S/N 6615247), and the other was a production model (aircraft S/N 6715695). The results of the Phase D handling qualities tests are presented in this report (Part 1). The Phase D performance capabilities and vibration characteristics are presented in other reports (Part 2 and Part 3). No wing store jettison or armament subsystem firing tests were conducted during the Phase D program since adequate testing had been accomplished in those areas during the AH-1G Phase B program.

TEST OBJECTIVES

3. The objectives of the AH-1G Phase D test program were as follows:

a. To provide information for technical manuals and other service publications.

b. To determine compliance with applicable military specifications.

c. To determine compliance with contract guarantees.

d. To evaluate operational suitability for the armed helicopter mission.

DESCRIPTION

4. The AH-1G helicopter manufactured by Bell Helicopter Company (BHC) was designed specifically to meet the US Army requirements for an armed helicopter. Tandem seating is provided for a two-man crew. The main rotor system is a two-bladed, semi-rigid, "door hinge" type with the stabilizer bar removed. A conventional anti-torque rotor is located near the top of the vertical stabilizer. The AH-1G is equipped with a three-axis stability and control augmentation system (SCAS) to improve the aircraft handling qualities. The helicopter is powered by a Lycoming T53-L-13 turboshaft engine rated at 1400 shaft horsepower (shp) at sea level (SL) under standard day, uninstalled conditions. The engine is derated to 1100 shp due to the maximum torque limit of the main transmission. Distinctive features of the AH-1G are: the narrow fuselage (36 inches), the stub midwing with four external store stations, the integral chin turret. The flight control system is of the mechanical, hydraulically boosted, irreversible type with conventional helicopter controls in the aft cockpit (pilot station). The controls in the forward cockpit (copilot/gunner station) consist of conventional antitorque pedals and sidarm collective and cyclic controls. An electrically operated force trim system is connected to the cyclic and directional controls to induce artificial feel and to provide positive control centering. The elevator is synchronized with the cyclic stick. The armament configurations are changed by varying the wing stores and chin turret configuration. The pilot operates the wing stores and can fire the chin turret only in the stowed position. The copilot/gunner operates the flexible turret and can also fire the wing stores in an emergency. The wing stores can be jettisoned by either the pilot or gunner in case of emergency. The design gross weight (grwt) for the AH-1G is 6600 pounds, and the maximum grwt is 9500 pounds. More detailed aircraft information and operating limits of the AH-1G are presented in appendix II.

SCOPE OF TEST

5. During the AH-1G Phase D test program, 256 flights were conducted for a total of 368.8 flight hours of which 227.9 hours were productive test hours. Testing was conducted in California, from 12 June 1968 to 29 July 1969, at Shafter Airport (420-ft elevation), Edwards AFB (2300-foot elevation) and at high-altitude test sites near Bishop (4120-, 7010- and 9500-foot elevations). Testing was conducted to determine aircraft performance, handling qualities and vibration characteristics. Two aircraft were utilized during this test program. An early prototype aircraft (S/N 6615247) was utilized primarily for performance tests although a limited amount of stability and control testing was accomplished. A more current production aircraft (S/N 6715695) was utilized for the majority of stability and control testing. This second test aircraft was utilized not only to decrease total calendar time required for testing, but also to comply with USAASTA policy which recognized the desirability of performing handling qualities tests on a production aircraft. A breakdown of flights and flight hours by individual aircraft is presented in table 1. Of these totals, 83 flights (84.5 productive flight hours) were devoted primarily to quantitative stability and control testing. Throughout the test program, qualitative evaluations of handling qualities were made. This report contains only the results of the handling qualities tests. The various aircraft configurations evaluated during the handling qualities portion of the program are listed in table 2.

Table 1. Test Flights and Productive Flight Time.

Test helicopter	Total Test Flights	Handling Qualities Test Flights	Total Productive Test Hours	Productive Handling Qualities Test Hours
S/N 6615247 (prototype aircraft) ¹	201	28	161.8	18.4
S/N 6715695 (production aircraft) ²	55	55	66.1	66.1
Total (both aircraft)	256	83	227.9	84.5

¹Equipped with TAT-102A turret: one 7.62mm minigun (XM134).

²Equipped with XM28 turret in the hybrid configuration: one 7.62mm minigun (XM134) and one 40mm grenade launcher (XM129).

Table 2. Aircraft Armament Configurations.

Configuration	Armament Subsystems
Clean	TAT-102A or XM28 turret, no external wing stores
Outboard alternate	TAT-102A or XM28 turret, one XM159 outboard each wing
Heavy scout	TAT-102A or XM28 turret, one XM18 inboard each wing, one XM159 outboard each wing
Heavy hog	TAT-102A or XM28 turret, two XM159 each wing

6. The test program was conducted within the limitations established by the AH-1G Safety-of-Flight Release issued by USAAVSCOM (refs 11 and 12, app I).

7. The empty weight of the test aircraft in a clean configuration with test instrumentation installed was 5790 pounds with the center of gravity (cg) at fuselage station (FS) 205.97 for aircraft S/N 6615247 and 5920 pounds with the cg at FS 200.59 for aircraft S/N 6715695.

8. The AH-1G was evaluated as an armed tactical helicopter, capable of day or night operation from prepared or unprepared areas. The handling qualities of the AH-1G helicopter were evaluated to determine compliance with the requirements of paragraph 3.3.2 of the detail specification (ref 13, app I). The Handling Qualities Rating Scale (HQRS) used throughout this report is presented as appendix III. Specific conditions for each test are presented in the Results and Discussion section of this report.

METHOD OF TEST

9. Test methods and data reduction procedures used in these tests are established engineering flight test techniques and are described briefly in appendix IV. All flights were conducted and supported by USAASTA personnel. Tests were conducted in nonturbulent atmospheric conditions.

10. The flight test data were obtained from test instrumentation located on the pilot panel, copilot/gunner panel, photopanel and with oscillograph records. A detailed listing of the test instrumentation is included in appendix V.

CHRONOLOGY

11. The chronology of the AH-1G Phase D, Part 1 test program is as follows:

Phase B flight test completed on aircraft S/N 6615247	3 May	1968
Phase D flight test commenced on aircraft S/N 6615247	13 June	1968
Aircraft S/N 6715695 received	8 August	1968
Flight test commenced on aircraft S/N 6715695	4 September	1968
Flight test completed on aircraft S/N 6715695	10 October	1968
Flight test completed on aircraft S/N 6615247	29 July	1969
Advance copy submitted	15 April	1970

RESULTS AND DISCUSSION

GENERAL

12. This report presents the results of the engineering Phase D handling qualities flight tests of the AH-1G helicopter. The test data obtained during these tests were used for determining compliance with the detail specification (ref 13, app 1), and Military Specification MIL-H-8501A, (ref 14) and to provide information for use in technical manuals and other publications. The AH-1G met all contractual handling qualities requirements of MIL-H-8501A except for paragraphs 3.2.4, 3.2.7, 3.5.4.1, 3.5.5 and 3.5.5.1. Tests were not conducted to verify compliance with paragraphs 3.5.4.3, 3.5.4.4 and 3.5.4.5 of MIL-H-8501A. By contractual agreement, the handling qualities requirements presented in paragraphs 3.3 and 3.6 of MIL-H-8501A were not applicable to the AH-1G (app VI). Aircraft compliance with the vibration characteristics requirement presented in paragraph 3.7 is discussed in Part 3 of this report. There are four deficiencies for which correction is mandatory for adequate mission accomplishment: excessive cyclic control breakout forces; inadequate directional control; inability to achieve maximum tail rotor blade angle (19 degrees) when full left directional control/yaw SCAS geometry; and excessive tail rotor horsepower required for hovering and translational flight. There are five shortcomings for which corrective action is desirable: neutral static longitudinal stability at airspeeds near the limit airspeed (V_L); increase in right directional control displacement with increasing airspeed in a dive; directional instability between 10 and 18 knots at relative wind azimuths between 210 and 230 degrees; deterioration of longitudinal dynamic stability of the AH-1G with the SCAS inoperative; and decrease in lateral-directional damping with the SCAS inoperative.

13. The proposed Military Specification MIL-H-8501B (ref 15, app 1) was used in addition to MIL-H-8501A (ref 14) as a guideline for evaluating and analyzing dynamic stability test results. The contractor was not obligated to comply with any portion of MIL-H-8501B.

AIRCRAFT CONTROL SYSTEM RIGGING

14. Prior to testing, the aircraft flight and engine controls were rigged on both test aircraft in compliance with the appropriate

Army publications (ref 16, app I). Subsequent aircraft flight and engine control rigging changes were coordinated with the contractor technical representatives.

CONTROL SYSTEMS

15. The control system breakout forces and force gradients were determined during ground test with the rotor in a static position. Hydraulic and electrical power were provided by external units. The longitudinal, lateral and directional control systems were evaluated with the cyclic friction at the preset value as stated in the organizational maintenance manual (ref 16, app I). Control forces were measured at the center of the cyclic control grip and at the top of the directional control pedals in the aft cockpit (pilot station). Breakout forces (including friction) were determined by recording the force required to obtain initial movement of the control. The force gradients were obtained by continuously recording the force and control position as each control was displaced from trim. Control forces as a function of control position are presented in figures 1 through 3, appendix VII. The cyclic pitch control pattern is presented in figure 4.

16. Control forces measured in flight agreed with the static ground data except where severe maneuvers exceeded the capability of the hydraulic boost system. Whenever this boost saturation occurred, increased cyclic and collective control forces were noted.

17. The results of the cyclic control evaluation are summarized in table 3. The cyclic force gradients were positive, and there were no discontinuities noted. The magnitudes of both the longitudinal (2.5 pounds per inch) and lateral (1.5 pounds per inch) cyclic force gradients were suitable for the armed helicopter mission even though the longitudinal force gradient exceeded the maximum value stated in para 3.2.4, MIL-H-8501A. The cyclic breakout forces (4.5 pounds longitudinally and 3.5 pounds laterally) exceeded the maximum-allowed values stated in paragraph 3.2.4 of MIL-H-8501A and the approved deviation (ref 13, app I). The high breakout forces made precise aircraft control difficult during hovering flight. This condition was objectionable for lateral control inputs. The high breakout forces were not objectionable during forward flight up to maximum airspeed in level flight (V_H). However, at airspeeds in excess of V_H (diving flight), the longitudinal cyclic force characteristics coupled with the neutral to slightly positive static longitudinal stability gradient, discussed in paragraph 28, made it difficult to maintain airspeed and pitch attitude precisely (HQRS 5). However, the ability to attain adequate mission performance (ie,

target tracking and ordnance delivery) will vary with the competence level of each pilot and the magnitude of turbulence in the atmosphere. These two unknown factors (pilot competence level and atmospheric turbulence) could cause the assigned HQRS to vary from 5 to 7. The magnitudes of cyclic breakout forces and force gradients were unaffected by cyclic trim position. The excessive cyclic control breakout forces are unacceptable for satisfactory operational use and reduction is mandatory for adequate accomplishment of the attack helicopter mission.

Table 3. Cyclic Control Breakout Forces and Force Gradients.

Rotor static Force trim ON			
Test	Maximum Allowed by MIL-H-8501A (1b)	Approved Contract Deviation (1b)	Test Results (1b)
Longitudinal breakout force (including friction)	1.5	2.0 (± 0.25)	4.5
Longitudinal force gradient	2.0 lb/in.	None	2.5 lb/in.
Longitudinal force at full throw. ¹	8.0	None	18.0
Lateral breakout force (including friction)	1.5	2.0 (± 0.25)	3.5
Lateral force gradient	2.0 lb/in.	None	1.5 lb/in.
Limit lateral force at full throw. ¹	7.0	None	18.0

¹Control displaced from a 50-percent control trim position in both directions.

18. There was no measurable change in the cyclic control force characteristics with the SCAS inoperative. With the force trim system OFF, the lateral and longitudinal force gradients were essentially zero; and breakout forces were only slightly less than those measured with the force trim ON. Turning off either hydraulic system had no effect on the cyclic breakout forces or force gradients.

19. The cyclic control position pattern, presented in figure A, shows that the available longitudinal control is a function of the lateral control position. Similarly, the lateral control is a function of the longitudinal control position. The position of the collective control has no effect on the cyclic control pattern.

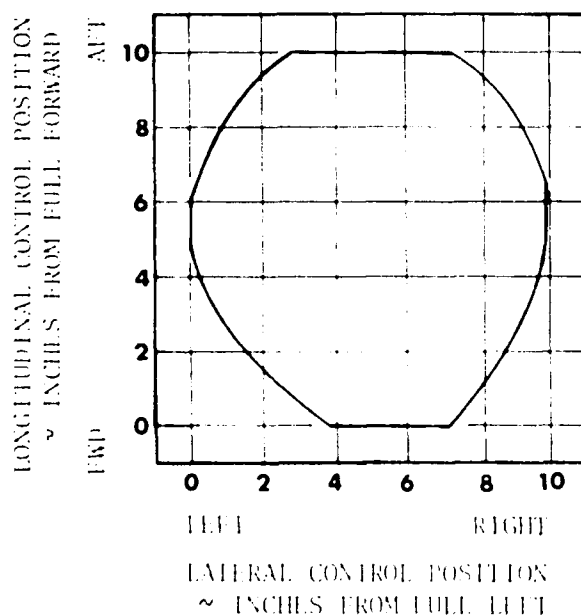


Figure A. Cyclic Pitch Control Pattern.

20. The directional control breakout forces with both boost systems operating and with the number ONE hydraulic boost system inoperative, complied with the requirements of MIL-H-8501A, paragraph 3.3.13, (table 4). The breakout force was 20 pounds with the number TWO hydraulic boost system inoperative. This value (20 pounds) complies with the system failure requirements of MIL-H-8501A, paragraph 3.5.8. At all conditions tested, there were discontinuities in the directional force gradient; thus, the requirement of MIL-H-8501A, paragraph 3.3.11, was not met. These directional force gradient discontinuities occurred at pedal positions not normally encountered in forward flight. The force gradient was zero with the force trim OFF. The directional control system breakout force and force gradient are satisfactory even with the minor discontinuities mentioned above.

Table 4. Directional Control Breakout Forces and Force Gradients.

Rotor static		Force trim ON	
Test	Maximum Allowed by MIL-H-8501A (lb)	Contractor Deviation	Test Results (lb)
Directional breakout force (including friction)	7.0	None	5.0
Directional force gradient	None	None	9.0 lb/in.
Directional force at full throw ¹	15.0	None	20.0 to 25.0

¹Control displaced from a 50-percent control trim position in both directions.

21. Collective control forces were not quantitatively evaluated during this test. However, qualitatively, the collective control forces were satisfactory for operational use.

STATIC TRIM STABILITY

22. Static trim stability characteristics about all three axes were evaluated in climbing, autorotational, diving and level flight. The tests were conducted at each of the configurations and flight conditions listed in appendix VIII. The effect of removing the landing gear cross-tube fairings was evaluated in the clean configuration during level flight and dives. The static trim stability of the aircraft was determined by recording the control positions at various stabilized zero-sideslip flight conditions. The summary of the longitudinal trim curves are presented in figures 5 through 7, appendix VII. The static trim curves which present the various control positions as a function of airspeed are shown in figures 8 through 27.

23. At all conditions tested, the remaining longitudinal control displacement was never less than 1.5 inches (15 percent) from the forward control limit and 2.6 inches (26 percent) from the aft control limit (fig. B). A significant change in longitudinal control

position with cg variation was noted. The longitudinal trim curve characteristics were positive (increasing forward control with increasing speed) from approximately 40 to 170 KCAS and are satisfactory for all conditions tested. The longitudinal control gradient was evaluated qualitatively at airspeeds between hover and 40 KCAS in forward flight. This evaluation at low airspeeds revealed a slight discontinuity in the longitudinal control gradient. This discontinuity was not objectionable to the pilot and did not violate the requirements of paragraph 3.2.10 (MIL-H-8501A). The change in longitudinal control position with airspeed is neutral at airspeeds during high-speed dives at airspeeds in excess of 170 KCAS. At speeds above V_H , this is essentially static longitudinal collective-fixed stability, discussed in paragraph 28. This neutral or negative longitudinal trim stability contributed to the increased pilot workload while maintaining selected airspeed and pitch attitude during dives. There was no significant change in the longitudinal control gradient with gross weight and configuration (wing stores) changes.

LEGEND	CONFIG	GRWT (LB)	DEN ALT (FT)	ROTOR SPEED (RPM)	LONG CG (INCH)
————	CLEAN	8460	4540	524	201 (AFT)
-----	CLEAN	7360	4460	524	190 (FWD)

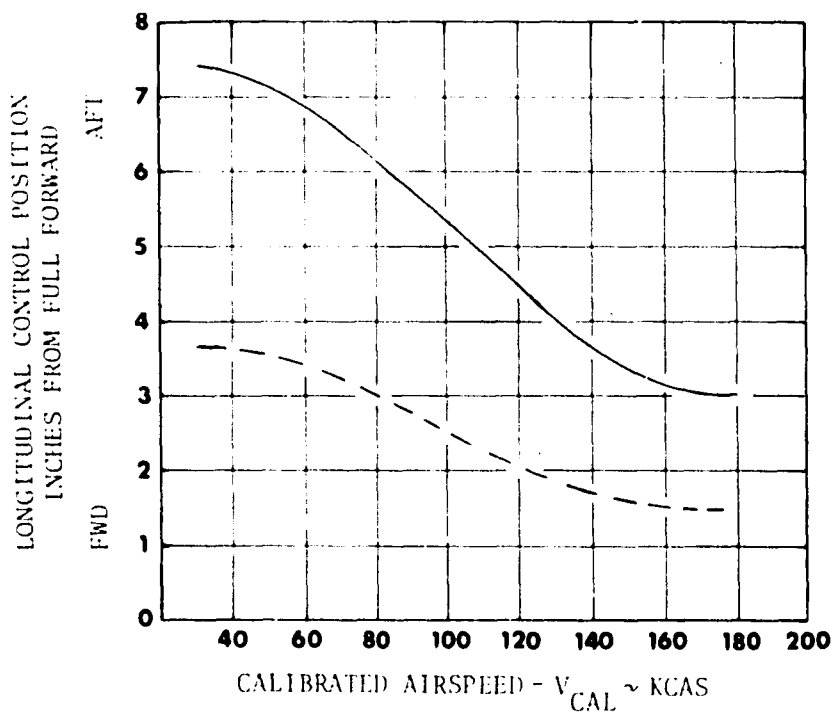


Figure B. Static Trim Stability.

24. There was a significant change in pitch attitude (as much as 10 degrees) between the forward and the aft cg loadings throughout the airspeed range in all flight conditions. This variation in pitch attitude with cg shift was readily apparent to the pilot but was not objectionable. There were slight variations in aircraft pitch attitude at a given airspeed with configuration and gross weight changes. These variations were small and not apparent to the pilot.

25. During zero sideslip stabilized flight at all conditions tested, the remaining lateral control displacement was never less than 4 inches (40.5 percent) from the left control limit and 2.9 inches (29.2 percent) from the right control limit. The lateral cyclic control migration was gradual and was not disconcerting to the pilot as the airspeed was varied between trim points. The lateral control position was farther right at a forward cg loading than at an aft cg loading. Gross weight, symmetrical configuration changes and altitude had no significant effect on lateral control requirements.

26. During stabilized forward flight at airspeeds in excess of 36 KCAS for all conditions tested, the remaining directional control displacement was never less than 1.75 inches (29.3 percent) from full right and 1.3 inches (21.8 percent) from full left. The maximum left directional control displacement occurred at low forward airspeeds (35 KCAS or less). The increasing right directional control was required as airspeed increased from 35 KCAS to the airspeed for minimum power required. Increasing left directional control was then required with increasing airspeed up to V_H . As airspeed increased from V_H to V_L , the migration of the directional control displacement was to the right. This increasing right directional control with airspeed contributed to the excessive pilot attention required to maintain zero sideslip during dives. Since the amount of sideslip present affects firing accuracy of the weapons, this characteristic is considered to be a shortcoming which detracts from mission effectiveness. For a given airspeed, an increase in left directional control was required for the following: changing longitudinal cg from forward to aft, increasing gross weight, increasing altitude and symmetrically increasing equivalent flat plate area by adding wing stores. Directional control trim position changes attributed to these variations were not noticeable to the pilot. Since an adequate margin was available in all forward flight conditions, this characteristic is acceptable. Qualitatively there was no significant change in the static directional trim stability with the landing gear cross-tube fairings removed.

STATIC LONGITUDINAL COLLECTIVE-FIXED STABILITY

27. The static longitudinal collective-fixed stability characteristics were examined at several different configurations, altitudes and cg loadings. Only the general characteristics noted and significant changes with variations in the above parameters are discussed in this section. These tests were conducted by first trimming the aircraft at the desired airspeed. The aircraft was then stabilized at several airspeeds greater and less than the trim airspeed while maintaining the trim collective control position. The force trim was also maintained at the trim setting. The tests were conducted at each of the configurations and trim conditions listed in appendix VIII. The summary of the longitudinal trim curves are presented in figures 28 through 31, appendix VII. Data were recorded at each stabilized airspeed and are presented in figures 32 through 65.

28. The longitudinal control position gradient was positive (forward cyclic required to maintain an airspeed greater than trim) for all conditions tested at airspeeds from 40 to 170 KCAS. However, the gradient became less positive at higher trim airspeeds and was essentially neutral at airspeeds in excess of 170 KCAS. The neutral static longitudinal collective-fixed stability at airspeeds in excess of 170 KCAS does not meet the requirements of MIL-H-8501A, paragraph 3.2.10. At airspeeds less than 40 KCAS, the static longitudinal collective-fixed stability was similar to the static trim stability discussed in paragraph 25. These data are presented graphically in figure C. The longitudinal control position gradient was more positive at a forward cg loading than at an aft cg loading for a given flight condition. Altitude, gross weight and configuration variations (wing stores) had no significant effect on the longitudinal control position gradient. The high longitudinal friction band masked the longitudinal force gradient, making the measured longitudinal force stability characteristic impractical to evaluate. As a result, the control force data in figures 32 through 65, appendix VII, have had the breakout forces analytically removed. The nearly neutral static longitudinal stability at airspeeds in excess of V_H contributed to the increased pilot effort required to stabilize the aircraft at a desired airspeed and detracted significantly from mission suitability (HQRS 4). This problem was further aggravated by the high longitudinal breakout forces and friction band. The longitudinal control position and force gradients at airspeeds in excess of V_H are minimally acceptable, and an increase of these gradients is desirable for improved service use.

CONFIG	GRWT (LB)	DEN ALT (FT)	ROTOR SPEED (RPM)	LONG CG (INCH)
OUTB'D ALT	8190	4910	324	201(AFT)

NOTE: POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLIC REQUIREMENT WITH INCREASING AIRSPEED

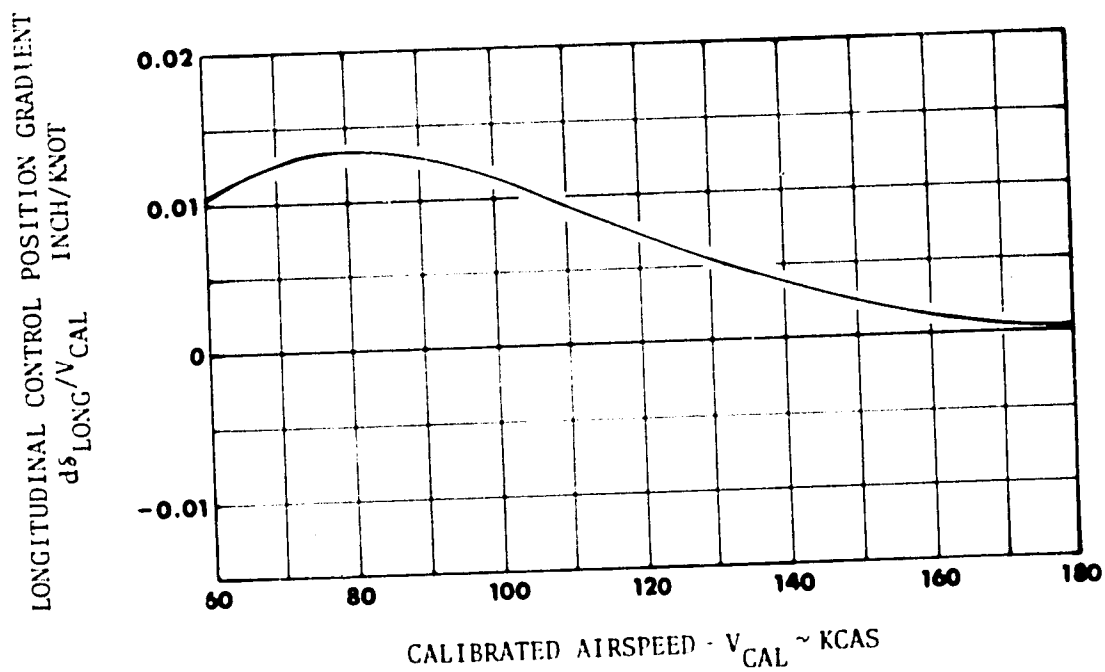


Figure C. Static Longitudinal Collective Fixed Stability.

29. The static longitudinal data presented in the report on the BHC Model 209 helicopter (ref 17, app 1) showed a neutral longitudinal control gradient in a dive. In Part 1 of the AH-1G Phase B report (ref 2), a strong recommendation was made for an increase in the longitudinal stability gradient at high speeds. It was also stated in reference 17, "nominal pilot attention was required to maintain a constant airspeed during high-speed dives."

30. The change in pitch attitude (nose-down attitude change with increased airspeed from trim is defined as positive) with respect to airspeed was neutral in low-speed level flight (60 KCAS trim speed) and became positive with increasing airspeed at a forward cg. These characteristics were similar to those observed during static trim stability testing. The pitch attitude gradient was more positive at an aft cg loading than at a forward cg loading at V_H and V_L . There was no significant change due to the variations in altitude, gross weight or configuration.

31. The changes in lateral cyclic control requirements during these tests were small, and excessive pilot attention was not required to maintain wings-level flight. At airspeeds greater than trim, more right directional control was required. At airspeeds less than trim, more left directional control was required. The directional control trim position changes with varying airspeed required some pilot compensation in order to maintain zero sideslip. This characteristic was most apparent during simulated weapons delivery maneuvers and target tracking tasks. During target tracking, moderate pilot compensation was required in order to achieve desired performance (HQRS 4). This shortcoming detracts from the armed helicopter mission suitability.

32. The longitudinal collective-fixed stability curves with landing gear cross-tube fairings removed are presented in figures 64 and 65 and the summary is presented in figure 31, appendix VII. The removal of these fairings did not significantly affect the longitudinal or lateral control migration characteristics. During flight in this configuration at trim airspeeds approaching V_L , the directional control gradient (dc_{DIR}/dV_{CAL}) did not vary with airspeed as with the fairings installed.

STATIC LATERAL-DIRECTIONAL STABILITY

33. Tests were conducted to determine the static directional stability and dihedral effect throughout the airspeed-sideslip envelope. The static directional stability and dihedral effect

were measured by recording data during stabilized flight at various sideslip angles while maintaining a constant heading at selected trim airspeeds and flight conditions. Tests were conducted at each of the configurations and trim conditions listed in appendix VIII. Summaries of the lateral-directional stability data are presented in figures 66 through 69, appendix VII. The test results are presented in figures 70 through 95, appendix VII.

34. Deviation number 1 (ref 13, app I), states that paragraph 3.3 of MIL-H-8501A shall not be applicable as a design guide for the stability and control characteristics. This deviation was interpreted by USAASIA to include virtually all lateral-directional handling qualities. The deviation should have provided specific guidelines to be used in determining acceptable lateral-directional handling qualities. Since inadequate guidance was provided, MIL-H-8501A was used as the criterion against which all lateral-directional stability characteristics were evaluated.

35. The static directional stability and dihedral effects were positive (increasing right directional control, left bank angle and left lateral control with increasing left sideslip) for all conditions tested except autorotation. The variation in directional and lateral control requirements was essentially linear as sideslip was varied about trim. In autorotation at an airspeed of 60 KCAS, the static directional stability was slightly positive while the dihedral effect was neutral. This characteristic does not comply with the requirements of para 3.3.9, MIL-H-8501A. This neutral dihedral effect in autorotation was apparent to the pilot, since directional control inputs did not establish roll rates (HQRS 3). This characteristic does not detract from mission suitability since acceptable performance could be achieved with minimal pilot compensation.

36. As engine power was increased the static lateral-directional stability gradients increased and were greatest during climbing flight at 60 KCAS. The static directional stability and effective dihedral increased as airspeed increased and reached maximum at V_L . The static directional stability gradient ($d\delta_{pedal}/d\beta$) became more positive as the cg location was changed from aft to forward. An increase in density altitude increased the static directional stability and effective dihedral slightly. There was no significant change in the static lateral-directional handling qualities when the aircraft configuration (wing stores) and gross weight were varied.

37. The static lateral-directional handling qualities are satisfactory for all conditions tested. One undesirable feature which was noted is the excessively high dihedral effect at V_L . The resultant roll rate is high for a small directional control input. This characteristic could cause the pilot to easily over control the aircraft when using directional control. In addition, this also contributes to the excessively high roll rates encountered during engine power loss at high airspeed (para 99).

38. The aerodynamic side-force characteristics as indicated by bank angle during steady sideslips were positive at all conditions tested and increased significantly with increasing airspeed. The side-force characteristics were essentially unchanged at all conditions tested except at high gross weight where a reduction in bank angle for a given amount of sideslip at the high airspeeds (140 to 170 knots) was noted.

39. The static lateral-directional stability characteristics for the landing gear cross-tube fairings removed configuration are presented in figures 94 and 95, appendix VII. A summary plot comparing data with the fairings on and off is presented in figure 69, appendix VII. The directional stability was more positive with the fairings removed. There was no significant difference in dihedral effect between the two configurations.

TRANSLATIONAL FLIGHT HANDLING QUALITIES EVALUATION

40. Translational flight is defined as flight in any direction with relative wind azimuths at any value from zero to 360 degrees (measured clockwise from nose of aircraft) at airspeeds between zero and 35 knots either in ground effect (IGE) or out of ground effect (OGE). The objectives of these tests were to evaluate the handling qualities and to determine control margins in translational flight. Deviation number 1 (app VI) is interpreted as exempting the AH-1G from complying with the lateral-directional handling qualities criteria as stated in MIL-H-8501A. Since no other guidance was provided, test results reported herein, where appropriate, are compared to the above specification to permit a basis for evaluation. A secondary purpose of this test was to determine the amount of tail rotor horsepower required to stabilize the aircraft at various combinations of wind azimuths and wind speeds. A calibrated ground pace vehicle was used as an airspeed reference during these tests. Conditions tested are listed in table 5. Results of the translational flight handling qualities are graphically presented in figures 96 and 125, appendix VII. The dashed portion of the faired curves on these plots indicates extrapolated data.

Table 5. Translational Flight Handling Qualities Evaluation.

Test Condition ¹	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
1	8,240	-40	199.6	324
2	8,060	140	200.4	312
3	8,050	5,270	200.7	324
4	7,210	11,120	195.4	324

¹All tests conducted in the heavy scout configuration with rocket pod fairings removed.

41. Control of skid height, roll attitude and pitch attitude during translational flight was good (HQRS 2) with one exception. This was the abrupt longitudinal trim change for rearward flight in the 10- to 15-knot range for small speed changes. The longitudinal control changes were approximately 1 inch in this speed range (HQRS 5).

42. The directional control capability was significantly less than that required to meet paragraphs 3.3.5 and 3.3.6, MIL-H-8501A. To meet these requirements significantly more tail rotor thrust (directional control), than is presently available, would be required. A directional control margin of 10 percent (0.71 inches for the test aircraft) enabled the pilot to control and maneuver the aircraft in translational flight (HQRS 5). Directional control margins less than 10 percent were inadequate for maneuvering due to the magnitude of average pedal inputs and the control travel limitation problem discussed in paragraph 47 with the yaw SCAS operating.

43. The critical area of insufficient directional control for test condition number 1, table 5, was with wind from 45 to 70 degrees at a velocity of 17 knots. The area (bounded by wind azimuth and velocity) of inadequate directional control increased with combinations of increasing altitude, increasing gross weight and/or decreasing rotor speed. At the most critical condition, number 4 of table 5, the directional control margin was less than 10 percent at all wind azimuths and at velocities from zero to 3 knots. At velocities greater than 3 knots, the area of inadequate directional control was between 30 and 300 degrees. Flight operations

at this gross weight/density altitude condition can not be conducted safely because of inadequate directional control.

44. Directional control of the test aircraft was lost (uncontrolled right yaw) several times during the test at condition number 4, table 5. Recovery of the aircraft was accomplished by reducing power and allowing the skid tubes to lightly contact the ground. The friction between the ground and the skid tubes gradually checked the turning rate of the helicopter. After stopping the turning rate, the collective was lowered and the aircraft landed. The full left directional control pedal was maintained until the yaw rate was arrested.

45. The effect of this major deficiency is well illustrated in the weekly summaries published by the US Army Board for Aviation Accident Research (USABAAR). Between 27 January and 13 July 1969, these summaries noted nine accidents due to loss of left directional control causing major damage (including one accident where flying debris caused major damage to a second aircraft), one accident causing minor damage, one accident in which the damage was not reported and eight incidents.

46. Figure D shows the recommended IGE translational flight envelope. The envelope is based on a directional control margin of 10 percent for any combination of wind velocity and wind azimuth. It is mandatory that the directional control system for the AH-1G be improved to provide better control characteristics.

- NOTES: 1. ROTOR SPEED 324 RPM
2. ENVELOPE BASED ON A 10 PERCENT DIRECTIONAL
CONTROL MARGIN AT ALL WIND AZIMUTHS

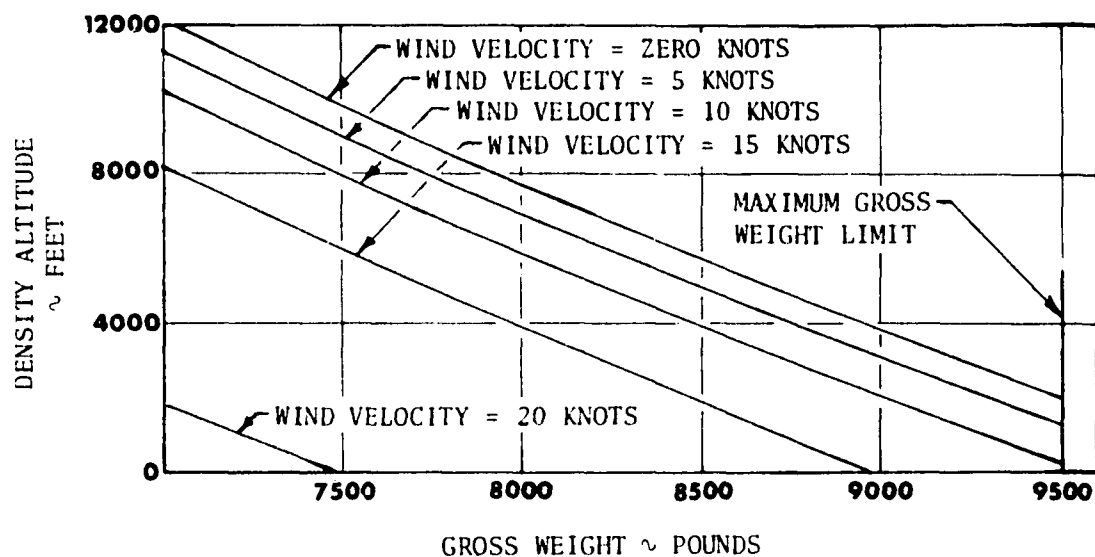


Figure D. Recommended In-Ground-Effect Translational Flight Envelope.

47. The 10-percent directional control position margin is equivalent to a tail rotor blade angle change of 3.0 degrees. Standard rigging of the tail rotor is 19.0 degrees for full left control and -11.0 degrees for full right control with the yaw SCAS actuator centered. Due to a travel limitation in the control linkage between the pedals and the SCAS actuator, the amount of tail rotor blade angle available with full left pedal applied can vary from 19.0 to 16.0 degrees depending on the position of the yaw SCAS actuator. With the yaw SCAS ON, the left pedal margin can be reduced to zero (a tail rotor blade angle of 16.0 degrees) with the yaw SCAS actuator in the most adverse position. This condition is further complicated by the fact that the pilot has no way of knowing how much directional control is available with the yaw SCAS operating. Since the IGE performance is limited by the directional control available, it is mandatory that the directional control be modified so that the maximum tail rotor blade angle of 19 degrees can be achieved regardless of the position of the SCAS actuator.

48. The AH-1G was directionally unstable in wind velocities between 10 and 18 knots at relative wind azimuths between 210 and 330 degrees (clockwise from nose of aircraft) for test conditions 1, 2 and 3, table 5. Rapid and sometimes large directional control excursions were necessary to maintain a heading at these unstable flight conditions (HQRS 5). Also, large changes in longitudinal control were required as the relative wind velocity varied in this area. Pilot recognition and reaction times following small excursions in yaw determined the frequency and magnitude of the directional control inputs. These tests were conducted with the yaw SCAS OFF to provide the pilot with accurate control available information and to insure that a full 19 degrees of tail rotor blade angle was available. Tests were also conducted with the yaw SCAS channel ON to qualitatively evaluate the damping effect. The directional stability was only slightly improved with the directional SCAS operating. This directional instability in translational flight is a shortcoming and detracts from the mission suitability of the aircraft. This instability was encountered under similar conditions and reported in references 3 and 8. Figure E illustrates the area of this instability.

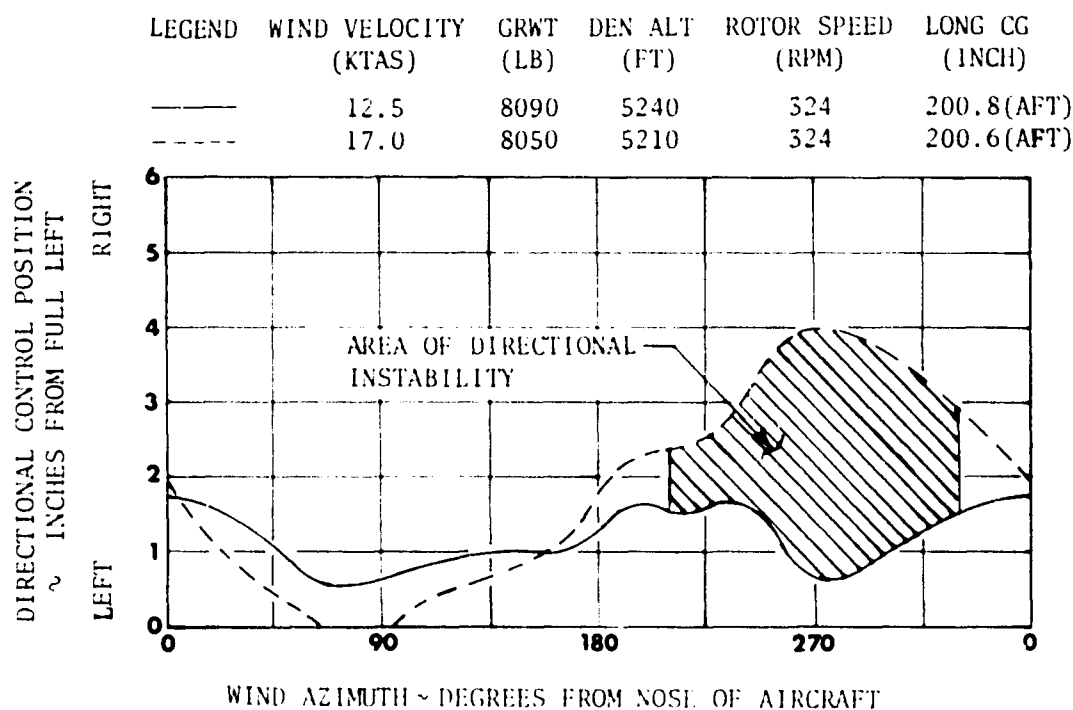


Figure E. Directional Control Position
In-Ground-Effect at Various Wind Azimuths.

49. The AH-1G is further limited by the maximum power transfer capability of the tail rotor drive system. Test results indicate that the tail rotor horsepower required to stabilize the aircraft increased nonlinearly as the directional control approached the left limit. Although a tail rotor drive system torque limit could not be determined, the structural design criteria report (ref 18, app I) for the AH-1G stated that the antitorque drive system design limit was 386 foot-pounds of torque (122 shp at 1654 rpm). Peak tail rotor horsepower encountered during translational flight was 190 horsepower at SL. For a given tail rotor blade pitch angle,

the peak tail rotor horsepower generally decreased as altitude increased. The rapid and sometimes large directional control excursions discussed in paragraph 48 caused large tail rotor torque oscillations. The magnitude of these oscillations were 20 to 160 horsepower for some test conditions. The magnitude of tail rotor horsepower during stabilized hover is presented in reference 19, appendix I. During this test program, *eight* 42-degree gear boxes and *four* 90-degree gear boxes were replaced. Replacement of the 42-degree gear box was required when tail rotor horsepower in excess of 180 horsepower was encountered because of the unacceptable gear wear patterns. The 90-degree gear box required replacement when operated above 180 horsepower for limited periods. The excessive tail rotor horsepower required and resultant antitorque drive system damage are deficiencies and correction is mandatory.

50. Sideward and rearward flights were also conducted with landing gear cross-tube fairings removed. The fairings-off data are presented in figure 125, appendix VII. There was no significant difference in the handling qualities during translational flight as a result of removing the landing gear cross-tube fairings.

DYNAMIC STABILITY

51. The objective of the dynamic stability tests was to evaluate the aircraft short period response characteristics following a gust disturbance. Gust disturbances were simulated by making pulse-type control inputs of 1 inch for 0.5 to 1 second. Following the inputs, the control was returned to trim, and all controls were held fixed until either the aircraft motions damped or recovery action was required. Dynamic stability was evaluated following inputs in both directions for longitudinal, lateral and directional controls. Tests were conducted both with the SCAS ON and OFF. The tests were conducted at each configuration and trim condition listed in appendix VIII.

Longitudinal Dynamic Stability

52. The longitudinal dynamic stability characteristics are summarized in figure 126, appendix VII. The aircraft motions following longitudinal control inputs were analyzed by determining the damping ratios and undamped natural frequencies. Representative time histories are presented for selected trim airspeeds, SCAS ON and for the most critical conditions SCAS OFF in figures 127 through 133.

53. The AH-1G demonstrated strong positive damping of the longitudinal short-period mode with SCAS ON. After the initial response to control input, the pitch attitude, angle of attack and load factor all returned to trim with no overshoot. Correspondingly, pitch rate made one excursion in each direction and then returned to zero. No significant coupling was present in the yaw or the roll axis during or following a longitudinal pulse input. Damping characteristics were similar for both forward and aft pulses. The longitudinal dynamic stability characteristics of the AH-1G with the SCAS ON complied with paragraph 3.2.11 of MIL-H-8501A. These characteristics are highly desirable and enable target-tracking maneuvers for weapon firing to be accomplished with little pilot effort or compensation. The longitudinal stability characteristics SCAS ON significantly enhance the mission suitability (HQRS 1).

54. Longitudinal pulses with SCAS OFF resulted in rapid divergence of pitch rate and pitch attitude for most conditions tested. Recovery action was required in most cases before one complete oscillation. The time history of a longitudinal pulse and resulting oscillating aircraft motions with SCAS OFF are presented in figure 133, appendix VII. In the heavy hog configuration at a gross weight of 7740 pounds and at an aft cg condition, the pitch attitude achieved the double amplitude in less than 10 seconds. There was significant lateral coupling following longitudinal inputs with SCAS OFF. The aircraft rolled to the right during forward inputs and to the left with aft inputs. The lack of positive longitudinal damping and the lateral coupling increased the pilot work load for all forward flight tasks. The aircraft can be safely flown in this condition; and routine maneuvers, such as cruise, approach and landing, can still be preformed with adequate precision (HQRS 4). The suitability for use as a weapons platform and for flight under restricted visibility conditions is significantly reduced (HQRS 6).

Dynamic Lateral-Directional Stability

55. The lateral and directional dynamic stability data are summarized in figures 134 and 142, appendix VII. The aircraft motions following roll and/or yaw inputs were analyzed for damping ratios and undamped natural frequency. Figures 151 and 152 show the lateral-directional damping ratio as a function of both damped natural frequency and calibrated airspeed. Figures 135 through 141 and 143 through 149 show representative time histories of lateral-directional dynamic response characteristics.

56. Damping of the lateral-directional oscillations, commonly referred to as Dutch roll, with SCAS ON was strongly positive. In most cases, the roll and attitude responded to the input and then returned to trim with no overshoot. The heavy hog and clean configurations with SCAS ON demonstrated similar characteristics except during climb where the clean configuration was less damped than the heavy hog configuration. Altitude had no significant effect on damping of the lateral-directional oscillations nor did gross weight or mass distribution, such as the addition of rockets. A summary of the lateral-directional dynamic stability characteristics with SCAS ON is presented in figure F. With SCAS ON, the dynamic lateral-directional stability characteristics comply with the applicable requirements of MIL-H-8501A and are suitable for the intended mission. While the damping was strongly positive it did not limit or degrade the maneuvering capability.

- NOTES: 1. SCAS ON
 2. ALL CONDITIONS ON AIRCRAFT S/N 6715695 FALL WITHIN SOLID LINE
 3. \square DENOTES CONDITIONS TESTED ON AIRCRAFT S/N 6615247 WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

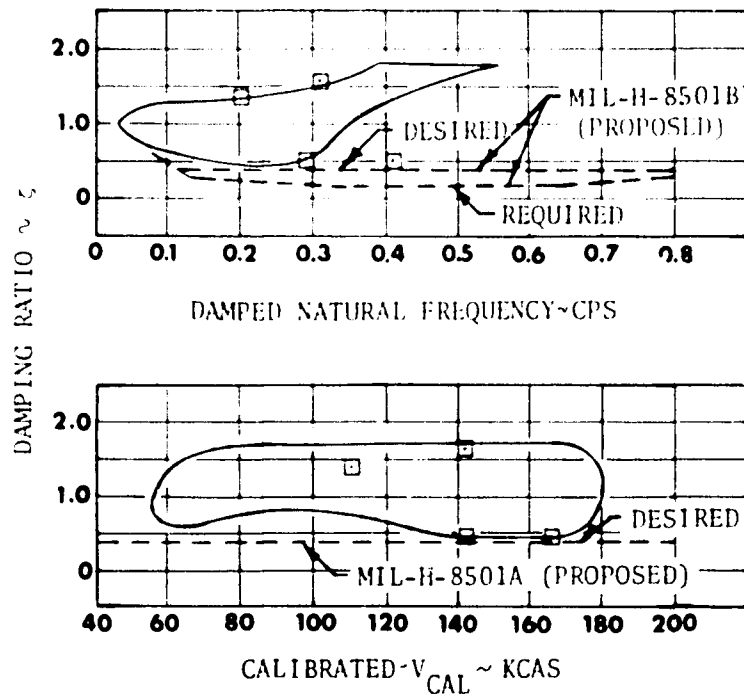


Figure F. Summary of Lateral-Directional Dynamic Stability.

57. In most conditions tested, the lateral-directional dynamic stability with the SCAS OFF was well below that value contained in the proposed specification, MIL-H-8501B (ref 13, app I), for an armed tactical helicopter. The yaw/roll oscillations or dutch roll had a period of approximately 4 seconds. The worst condition was the climb, clean configuration, at a 7210-pound grwt and an aft cg loading. A time history of this condition is presented in figure 141, appendix VII. The aircraft oscillations were divergent in roll and yaw for this test condition. At most conditions tested, damping ratios were less than 0.2. A summary of lateral-directional dynamic stability with SCAS OFF is presented in figure G. This low damping of the lateral-directional motions with SCAS OFF resulted in objectionable, uncomfortable aircraft motions, particularly at higher airspeeds. In addition, this characteristic, aggravated by the excessively high lateral breakout forces discussed in paragraph 17, resulted in a pilot induced oscillation in the roll axis at high speeds. This characteristic seriously detracts from mission suitability and makes satisfactory, effective completion of most missions questionable during SCAS OFF operations. The aircraft can be safely returned to base and landed. However, precise flight tasks are very difficult to perform (HQRS 6).

- NOTES: 1. SCAS OFF
 2. ALL CONDITIONS TESTED ON AIRCRAFT S/N 6715695 FALL WITHIN SOLID LINE
 3. \square DENOTES CONDITIONS TESTED ON AIRCRAFT S/N 6615247 WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

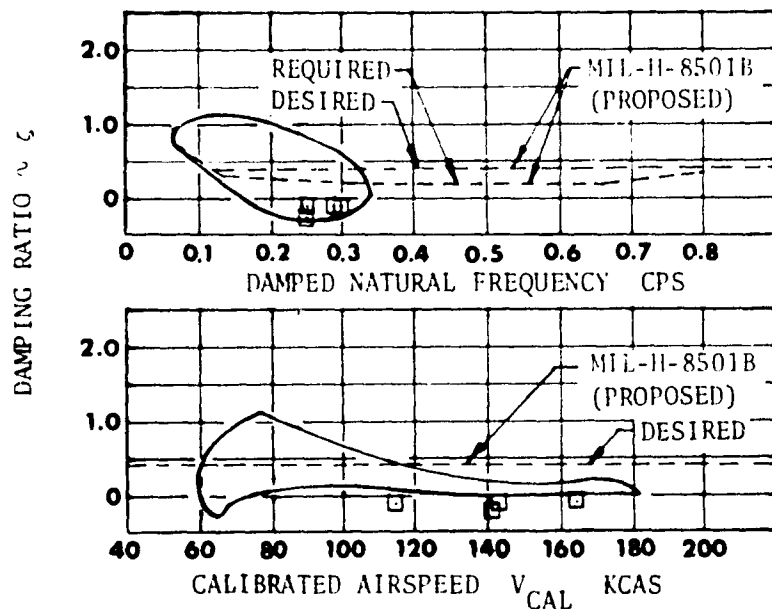


Figure G. Summary of Lateral-Directional Dynamic Stability.

58. The results of these tests agree closely with those described in reference 17, appendix I, with SCAS ON. However, with SCAS OFF, test results indicated a degradation in lateral-directional dynamic stability characteristics from the reference.

59. Lateral-directional dynamic stability characteristics were also evaluated for the clean configuration with the landing gear cross-tube fairings removed, with SCAS ON and OFF. A comparison of the clean configuration with fairings on and off is presented in figure 150, appendix VII. Time histories of lateral and directional pulses SCAS OFF are presented in figures 151 and 152.

60. With SCAS ON, the removal of the fairings had no significant effect on lateral-directional damping at airspeeds less than 160 KCAS (HQRS 2). At airspeeds in excess of 160 KCAS, the lateral-directional coupling increased and damping decreased (para 83). The increased lateral-directional coupling and decreased damping caused the pilot workload to increase beyond a tolerable limit when performing target tracking maneuvers (HQRS 7). An airspeed limit of 160 KCAS is recommended in order to maintain an effective target tracking capability when the landing gear cross-tube fairings are not installed.

61. With SCAS OFF, the removal of the landing gear cross-tube fairings significantly degraded the dynamic lateral-directional characteristics. Dutch roll oscillations were induced by either lateral or directional control inputs. The oscillations for most conditions were divergent and had a period of about 4 seconds and a negative damping ratio of 0.2. The rates in both axes increased rapidly to unacceptable levels (50 deg/sec in roll and 25 deg/sec in yaw). A limit of 115 KCAS is recommended when landing gear cross-tube fairings are not installed, and the SCAS is inoperative. Flight during periods of restricted visibility, such as at night or during instrument conditions with the fairings removed and with SCAS OFF, is not recommended (HQRS 8).

CONTROLLABILITY IN FORWARD FLIGHT

62. Controllability was evaluated in level flight, dive, autorotation, climb and hover throughout the flight envelope. The hover tests were performed at several different gross weights, rotor speeds and density altitudes. Controllability tests were also conducted in forward flight with the landing gear cross-tube fairings removed.

63. The objective of these tests was to evaluate the ability to control the aircraft by quantitatively evaluating the aircraft

reaction to a given control input. This was accomplished by measuring the aircraft attitude displacements, rates and angular accelerations that resulted per inch of control input. Step-type control inputs were utilized which consisted of rapidly displacing the control to the desired position (maximum input time of 0.2 seconds) and then holding this position until the maximum rate was reached or recovery action was necessary. The magnitude of the step inputs was varied (usually a minimum of three inputs in each direction). An adjustable, rigid control fixture was used to assist in achieving the desired inputs. The forward flight controllability test data are presented in figures 169 through 243, appendix VII. The forward flight controllability test results are summarized by presenting data for a 1-inch control input at the various flight conditions and airspeeds tested. These summaries are presented in figures 156 through 168. The dashed portion of the faired curves on these plots (figs. 156 through 168) indicates extrapolated data. Typical time histories of step inputs are presented in figures 280 through 286.

64. Controllability characteristics are discussed in terms of control sensitivity, control response and attitude displacement. Control sensitivity is defined as the maximum angular acceleration which results from a 1-inch control step input. Control response is defined as the angular rate which results from a 1-inch control step input. Attitude displacement is discussed in terms of aircraft displacement at 1 second after a control input.

Longitudinal

65. The longitudinal controllability test conditions are presented in table VII, appendix VIII. A portion of these tests were conducted with the SCAS OFF.

66. In the heavy hog configuration the longitudinal sensitivity was essentially constant at 10 deg/sec²/inch at all forward flight speeds up to V_L . In the clean configuration, however, longitudinal sensitivity was a constant 10 deg/sec²/in. at airspeeds up to 0.8 V_H and then increased with increasing airspeed to a value of 17 deg/sec²/in. at V_L . The time required to achieve the peak angular acceleration following a 1-inch step input did not exceed 0.5 second. In general, the forward step inputs resulted in slightly greater angular accelerations than did aft step inputs. Longitudinal control sensitivity with SCAS OFF was the same as with SCAS ON and was not a function of altitude. Only minor variations in longitudinal control sensitivity with changes in gross weight and cg were noted. The average value of sensitivity during climb and autorotation was approximately 9 deg/sec²/inch. Figure H summarizes longitudinal control sensitivity for all conditions tested.

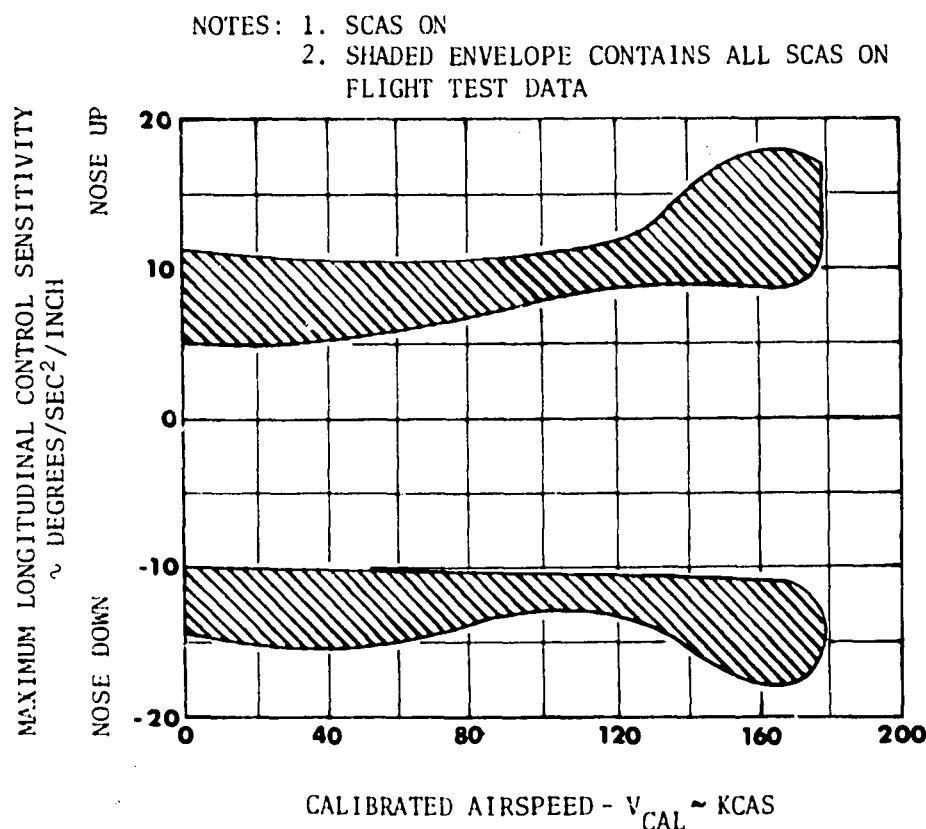


Figure H. Longitudinal Control Sensitivity.

67. The longitudinal controllability characteristics were also evaluated in terms of maximum response as defined in paragraph 64. The longitudinal response of the aircraft was slightly greater for a forward input than for an aft input. With SCAS ON, the longitudinal response averaged 7 deg/sec/in. and was not a function of configuration, gross weight, airspeed or altitude. The time required to achieve maximum rate (SCAS ON) was 1 second or less for all conditions tested. Maximum response was slightly higher at an aft cg than at a forward cg at airspeeds approaching V_L . In figure J, the maximum pitch rate data for all conditions tested are summarized.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

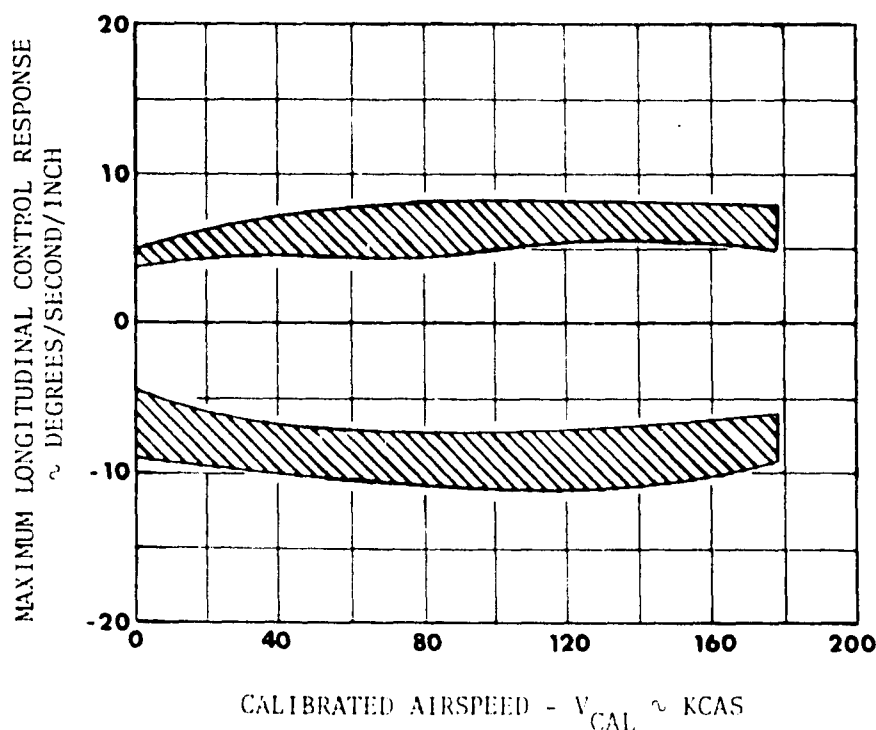


Figure J. Longitudinal Control Response.

68. Pitch rate at 1 second following a 1-inch longitudinal step input is presented for comparison of SCAS ON and SCAS OFF tests. This presentation is necessary because with SCAS OFF the maximum response was not achieved before recovery was necessary. The longitudinal response characteristics with SCAS OFF were similar to those for the SCAS ON condition except for the following differences:

- a. At airspeeds greater than 80 KCAS, the pitch rate at 1 second after the control input was greater with SCAS OFF. (A constant 6 deg/sec/in. with SCAS ON as compared to a maximum of 13 deg/sec/in. at V_L with SCAS OFF).
- b. At V_L and at an aft cg loading, the response was significantly greater with SCAS OFF.
- c. In all cases tested with SCAS OFF, a maximum response was not achieved since rate continued to increase until recovery was necessary.

69. The response resulting from an aft step input is in compliance with paragraph 3.2.11.1, MIL-H-8501A, as shown in figure 155, appendix VII, both the cg normal acceleration and the angular pitch velocity became concave downward in less than 2 seconds. The cg normal acceleration became concave downward at an average time of 1.56 seconds and the pitch rate at an average time of 0.3 second.

70. Pitch attitude displacement characteristics were determined by measuring pitch attitude change from trim at 1 second following a 1-inch step input. This was done both with SCAS ON and OFF. Figure K presents the summary of the SCAS ON data. Generally with SCAS ON, the displacement was a constant 5 degrees/inch and increased slightly between V_H and V_L . There was no change in displacement at 1 second with variations of configuration, gross weight and altitude. With SCAS OFF, the displacement increased with increasing airspeed. The only difference noted with a change in configuration with SCAS OFF was a slightly greater displacement in the clean configuration than in the heavy hog configuration.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

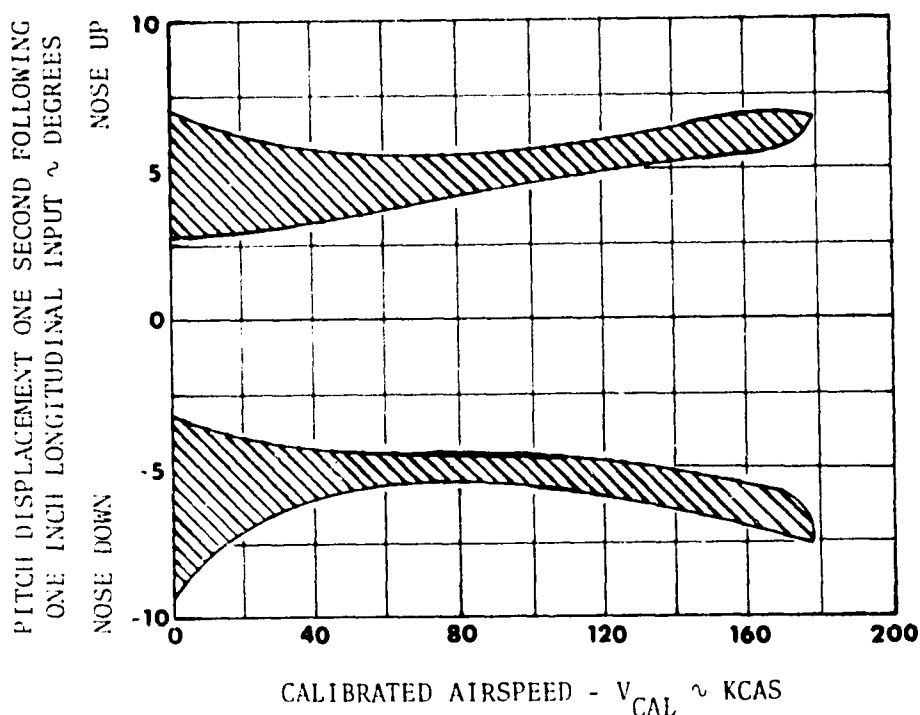


Figure K. Pitch Attitude Displacement.

71. Longitudinal controllability characteristics are considered to be satisfactory. Qualitatively, no objectionable characteristics were observed, and the aircraft reactions to longitudinal control inputs were highly satisfactory. During simulated target tracking maneuvers with SCAS ON, it was determined that a desired pitch attitude could be precisely maintained, and attitude changes could be easily and accurately accomplished (HQRS 2). The high level of pilot effort required to maintain an airspeed during dives was caused by the control force characteristics and the shallow static longitudinal stability gradients. The insensitivity of the longitudinal controllability characteristics to variations in weight, cg, configuration and altitude is highly desirable, and contributes significantly to mission suitability. The characteristics with the longitudinal SCAS OFF are good with little increase in pilot effort required for satisfactory mission accomplishment. A mildly annoying characteristics with SCAS OFF was a slight amount of control cross-coupling. A forward control input resulted in a right roll, and an aft control input resulted in a left roll.

Lateral

72. The lateral controllability characteristics were determined to be satisfactory. The lateral controllability test conditions are presented in table VIII, appendix VIII. A portion of these tests were conducted with the SCAS OFF. In all cases tested, the aircraft reacted in the proper direction with a lateral control step input, and no apparent hesitation nor discontinuities in resultant rates were noted. The sensitivity and response was greater with a left lateral control input than with a right control input. The deviation to MIL-H-8501A discussed in paragraph 34 also applies to this section.

73. The lateral control sensitivity at airspeeds less than 100 KCAS was approximately 16 deg/sec²/in. and was independent of altitude, gross weight or configuration. The time required to reach maximum angular acceleration was in all cases less than 0.5 second. At a given flight condition, the lateral sensitivity in climb was greater than that in level flight, and in autorotation it was less than in level flight. The maximum values of roll acceleration were achieved during climbs and in dives at V_L and were on the order of 25 to 30 deg/sec²/inch. Lateral control sensitivity characteristics with SCAS OFF were similar to those obtained with SCAS ON. Lateral control sensitivity data with SCAS ON are shown in figure L.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

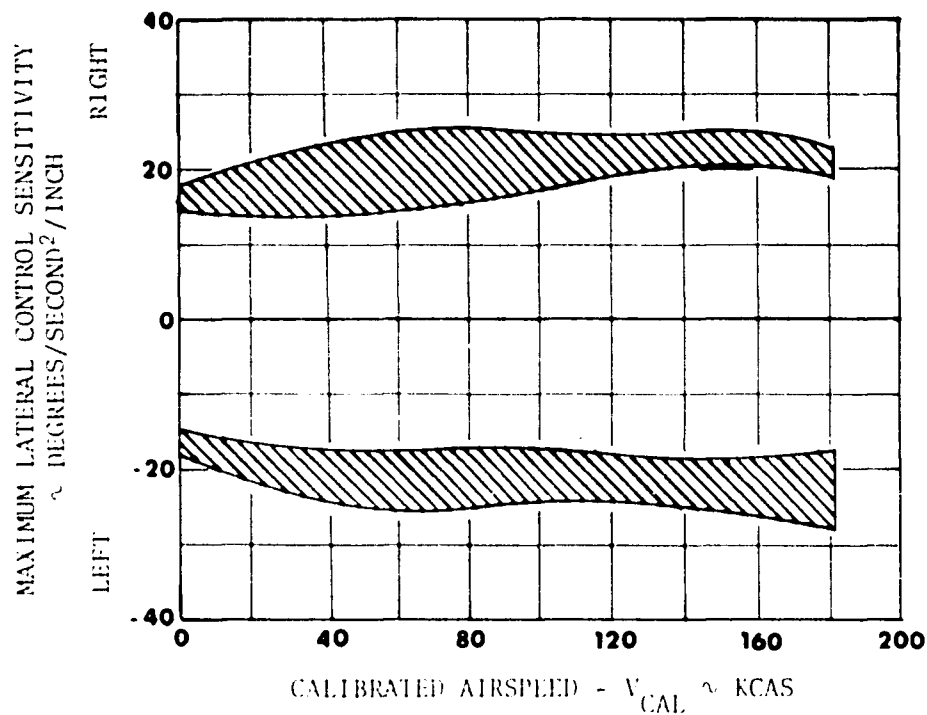


Figure 1. Lateral Control Sensitivity.

74. The maximum lateral control response with SCAS ON varied 10 deg/sec/in. at mid airspeeds (70 to 120 KCAS) to 20 deg/sec/in. at V_L in the clean configuration. Lateral control response was not a function of altitude or gross weight, but in the heavy hog configuration, higher maximum roll rates occurred than in the clean configuration (fig. 157, app VII). The time required to achieve maximum roll rate was approximately 1 second at all conditions tested with SCAS ON.

75. Lateral control response characteristics with SCAS OFF were similar to those observed with SCAS ON, except, as in the case of pitch response, a peak rate could not be achieved prior to initiating recovery due to the high rates and large roll displacements which occurred. Therefore, the SCAS OFF data are presented in terms of rate at 1 second after control input. The lateral control response characteristics are summarized in figure M. With SCAS ON, the AH-1G meets the requirements of paragraph 3.3.15 of MIL-H-8501A except for those areas, as indicated in figure M, where maximum roll rates exceeded 20 deg/sec/inch.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

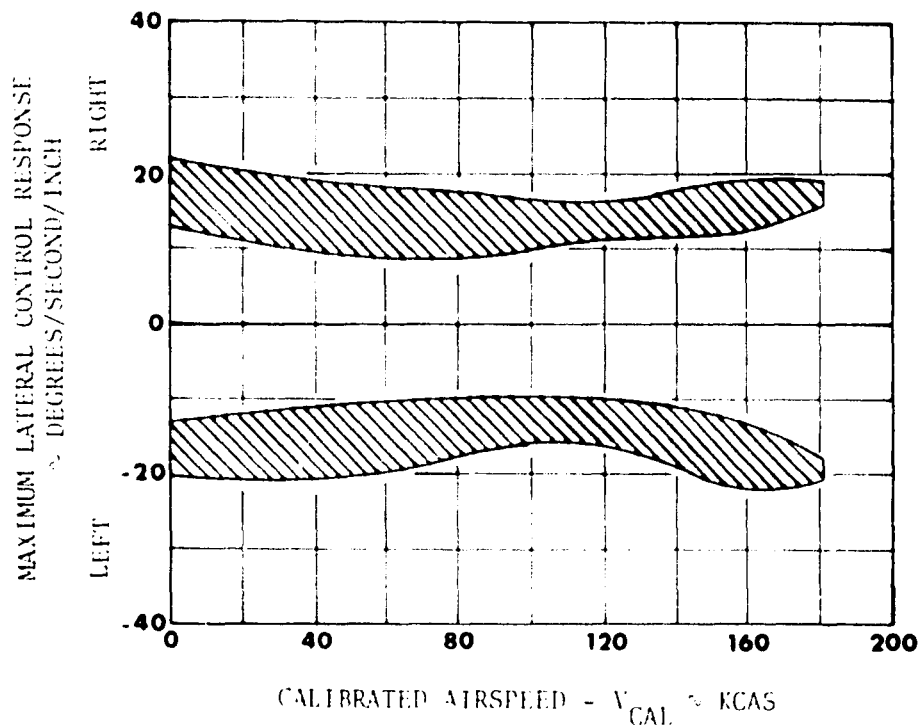


Figure M. Lateral Control Response.

76. The roll attitude displacement at 1 second following a 1-inch control input varied from 7 to 15 deg/inch. In general, the only parameters affecting the displacement were increased gross weight and loaded rocket pods, both of which decreased displacement. Roll attitude displacement characteristics were essentially the same for SCAS ON and SCAS OFF. Data with SCAS ON are summarized in figure N.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

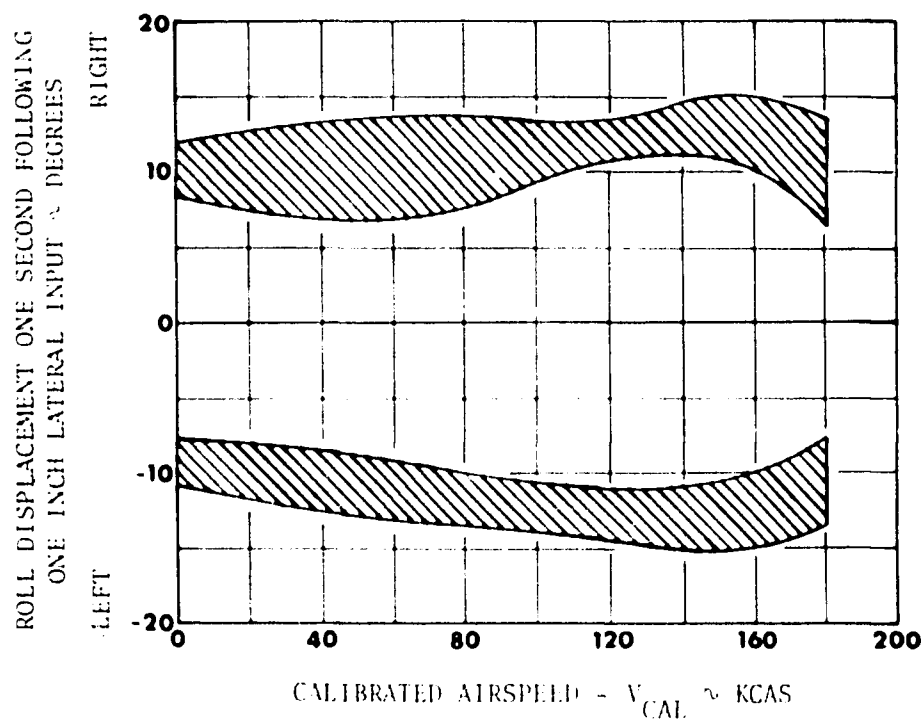


Figure N. Roll Attitude Displacement.

77. Qualitatively, the lateral controllability characteristics of the AH-1G in forward flight are satisfactory with SCAS ON. No objectionable characteristics were noted, and the aircraft reacts rapidly to a control input. The relatively high roll rates and roll accelerations observed, while in some cases exceed the

maximum values stated in MIL-H-8501A, are satisfactory for an attack helicopter. These characteristics contribute to the ability to make rapid turns and minimize time in return-to-target maneuvers (HQRS 2). However, these rates (22deg/sec/in.) are approaching the maximum allowable from a qualitative standpoint. A phenomenon was noted where an increase in engine torque resulted from a left control input, and a decrease in engine torque resulted from a right control input. This is discussed in detail in the Performance portion of the AH-1G Phase B report (ref 19, app I). No significant control coupling was encountered during the lateral controllability tests.

Directional

78. Directional controllability characteristics were investigated at the same conditions as longitudinal and lateral controllability and were generally satisfactory. The directional controllability test conditions are presented in table IX, appendix VIII. A portion of these tests were conducted with the SCAS OFF. In all cases, the directional inputs resulted in an initial yawing of the aircraft in the proper direction.

79. The directional control sensitivity decreased with increasing airspeed and was minimum at V_L . Sensitivity was greater in the clean configuration than in the heavy hog configuration at all airspeeds. Increasing gross weight and increasing altitude, in a given configuration, resulted in a significant decrease in control sensitivity, particularly at high airspeeds. In all cases tested, the maximum yaw acceleration occurred at 0.5 second or less after the control input. SCAS OFF characteristics were generally the same as SCAS ON. Data are summarized for all conditions tested (SCAS ON) in figure 0.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON
FLIGHT TEST DATA

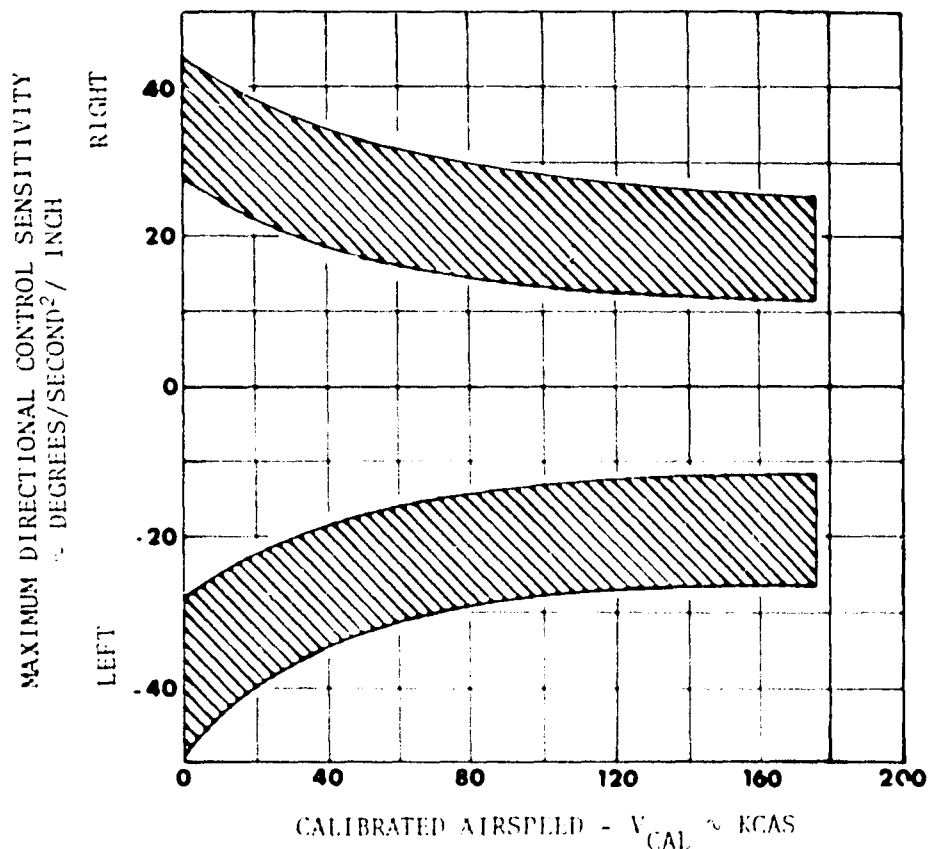


Figure O. Directional Control Sensitivity.

80. As with sensitivity, the directional control response was maximum at low airspeeds and decreased with increasing airspeed. Time to reach the maximum rate varied from 0.8 second (low altitude, light weight) to 1.5 seconds (high altitude, heavy weight). Differences in gross weight and configuration had no significant effect on the maximum yaw rate. Increasing density altitude resulted in a decreasing response. There was no significant change in directional control response characteristics with SCAS OFF when compared to corresponding SCAS ON condition. A summary of maximum directional control response is presented in figure P.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

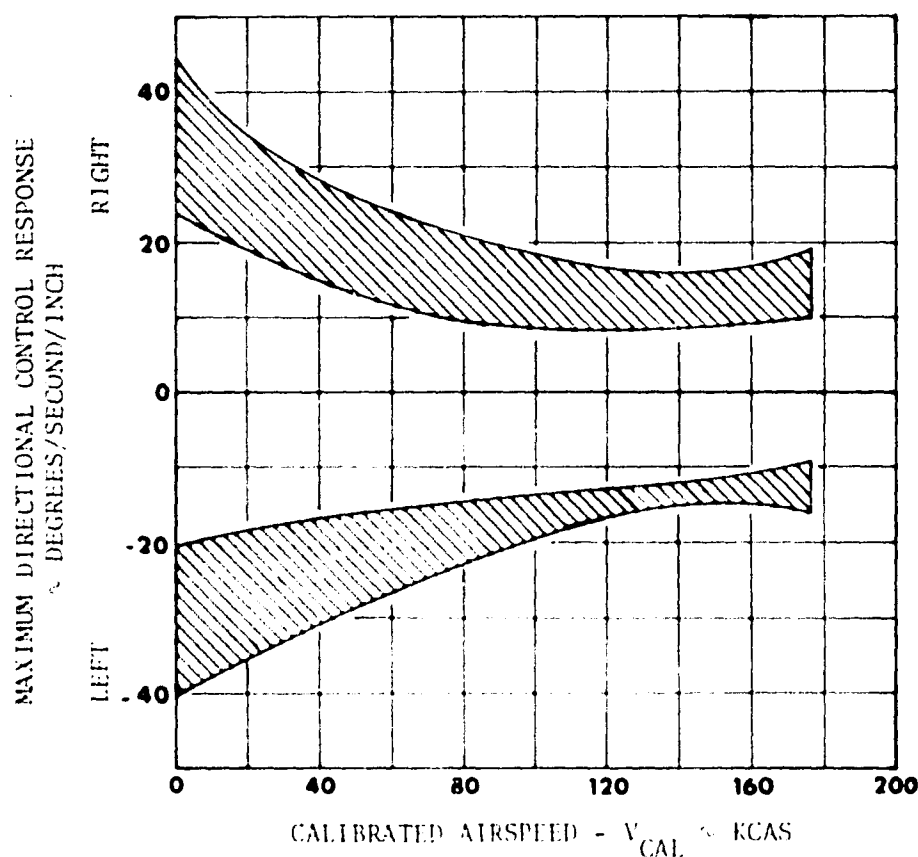


Figure P. Directional Control Response.

81. Yaw attitude displacement was defined at 1 second after a 1-inch pedal input. This displacement was maximum at low airspeeds and minimum at V_L . The heavy hog configuration had a slightly lower yaw displacement than did the clean configuration at all airspeeds. Increased gross weight or altitude also reduced the yaw displacement at 1 second. With SCAS OFF, the yaw characteristics were similar to those with SCAS ON except that all yaw displacements were decreased by 5 to 6 deg/inch. Figure Q presents a summary of the yaw displacement characteristics for all SCAS ON conditions tested.

- NOTES: 1. SCAS ON
2. SHADED ENVELOPE CONTAINS ALL SCAS ON FLIGHT TEST DATA

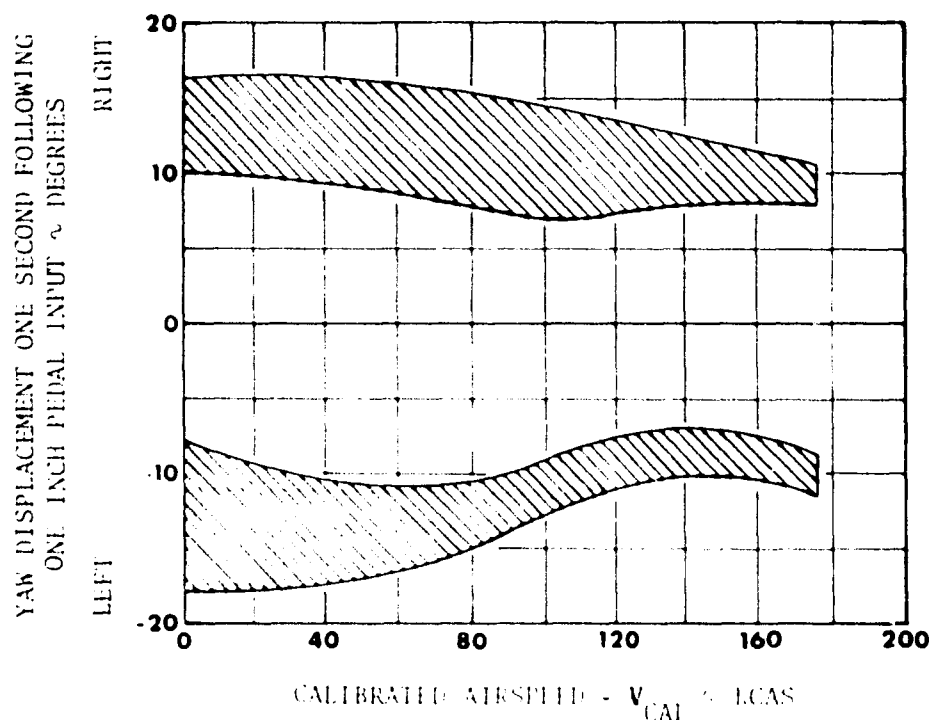


Figure Q. Yaw Attitude Displacement.

82. The directional controllability characteristics were good. During simulated tracking maneuvers, it was determined that, except for the characteristic of changing directional control trim with airspeed discussed in paragraphs 26 and 31, minimal pilot effort was required to maintain an adequate performance level (HQRS 2). One characteristic which was undesirable was the resultant high roll rate which occurred during forward flight at high speeds following a directional control step input. The roll was always in the same direction as the control input and was greater to the right than to the left. This phenomenon is due to the very high effective dihedral at this flight condition and, in fact, prevented the buildup of significant sideslip angle during directional step inputs at high speed. SCAS ON or OFF had no significant effect on this roll-yaw coupling.

LANDING GEAR CROSS-TUBE FAIRINGS EFFECTS

83. Controllability tests were conducted with landing gear cross-tube fairings removed at trim airspeeds of $0.8V_H$, V_H and V_L . Tests were conducted to investigate both lateral and directional characteristics. Only slight variations were noted between the two configurations in the yaw axis; however, a large increase in sensitivity and response was noted in the lateral axis with landing cross-tube fairing removed. With the fairings removed, the lateral sensitivity was more than $20 \text{ deg/sec}^2/\text{in.}$ greater than with fairings installed. The time to achieve maximum acceleration was essentially unchanged. The lateral response was approximately 10 deg/sec/in. greater, and time to maximum rate was 0.7 second as compared to 1 second with the fairings installed. Figure 164, appendix VII, illustrates the comparison between fairings on and off for lateral sensitivity and response. The maximum value of 24 deg/sec/in. lateral control response does not meet the requirement of paragraph 3.3.15 of MIL-H-8501A and is qualitatively determined to be excessive. The excessive roll rate and decrease in lateral-directional damping (para 60) made precise maneuvering of the aircraft extremely difficult when performing normal flight tasks (HQRS 5). However, pilot workload reached an intolerable level when performing maneuvers where precise attitude and coordinate flight were required to accomplish the intended mission for this aircraft (HQRS 7).

HOVER CONTROLLABILITY

84. Hover controllability tests were conducted primarily in the clean configuration. The hover controllability conditions tested are presented in tables X through XII, appendix VIII. A portion of these tests was also conducted with the SCAS OFF. The C_T range flown during these hovering tests was 0.0037 to 0.0052. These tests were conducted IGE at a skid-height range from 5 to 15 feet at mid cg loading. The hover controllability data are presented in figures 247 through 279, appendix VII. These data are summarized as a function of thrust coefficient (C_T) in figures 244 through 246.

Longitudinal

85. With SCAS ON, the longitudinal controllability characteristics varied slightly with C_T . The aircraft reaction was generally greater following a forward control input than with an aft input. The longitudinal sensitivity was approximately $10 \text{ deg/sec}^2/\text{in.}$, and time to reach maximum acceleration was approximately 0.2 second. The maximum response was essentially constant throughout the C_T

range at 5 deg/sec/inch. The time to reach maximum pitch rate varied from 0.8 to 1.0 second depending on the C_T . The longitudinal displacement at 1 second following control input remained relatively constant at 3.5 deg/in. as C_T varied. This exceeded the minimum value (2.05 deg/in.) required by paragraph 3.2.13 of MIL-H-8501A. There was no significant change in the longitudinal controllability characteristics in hover due to configuration change. The longitudinal controllability characteristics with the SCAS OFF were essentially the same as with SCAS ON except that the maximum pitch rate and resultant pitch attitude change were slightly greater.

86. The longitudinal controllability characteristics during hover were satisfactory. In all cases, the helicopter reacted in the desired direction to a cyclic control step input, and the resultant rates and accelerations were satisfactory. Precision hovering required an unnecessarily high amount of pilot effort due to the high cyclic breakout forces discussed in paragraph 17.

Lateral

87. The lateral control sensitivity with SCAS ON was approximately 16.5 deg/sec²/in., and the time required to achieve maximum acceleration was a constant 0.15 second. Maximum roll response varied from 18 to 21 deg/sec/in., and time required to achieve maximum rate varied from 0.75 to 0.9 second. Lateral controllability characteristics were essentially unaffected by variations in C_T store configuration, ordnance loading and sense of the input (left or right).

88. The lateral controllability characteristics changed only slightly when the SCAS was not operating. The maximum acceleration per inch of lateral cyclic control input was less in most cases, and the time to reach peak roll acceleration increased to approximately 0.35 second. The maximum roll rate and resultant roll attitude change were greater with SCAS OFF than with SCAS ON. The time to reach maximum roll rate remained the same (0.75 to 0.9 second).

89. The maximum allowable roll rate stated in paragraph 3.3.15 of MIL-H-8501A was exceeded slightly in some cases; however, no tendency to overcontrol was noted. In addition, the lateral controllability characteristics in hover comply with the requirement stated in paragraphs 3.3.16 and 3.3.18 of MIL-H-8501A.

90. The lateral controllability characteristics in hover were similar to the longitudinal controllability in that the aircraft reacted in the proper direction to a control step input, and the resultant rates and accelerations were satisfactory. The high

control breakout forces had a more detrimental effect on pilot effort required for precise hovering in the lateral axis than in the longitudinal axis (para 86).

91. The maximum tail rotor horsepower recorded during recovery from a left lateral step input during the controllability tests ranged between 200 to 260 horsepower. The magnitude of the tail rotor horsepower depended on the dynamic characteristics of the aircraft as well as the magnitude of the control input during recovery. Tail rotor horsepower was maximum at SL and decreased with altitude for a given control input. The 42- and 90-degree gear boxes were replaced several times during the tests because of unacceptable gear wear patterns. There was insufficient directional control to maintain a constant heading during recovery from a right lateral step input. This problem is related directly to the translational handling qualities discussed in paragraphs 42 through 46.

Directional

92. The directional controllability characteristics in hover varied significantly with variations in main rotor C_T . Figure R presents the results of this test. When hovering at a C_T greater than 0.00465, less than 1 inch of left directional control remained; hence, inputs were limited to the available control travel. The yaw displacement requirement of paragraph 3.3.5 of MIL-H-8501A was not met except within the very limited range of C_T values as indicated in figure R. Directional control margin was inadequate when the average directional control position was less than 10 percent from the control limit. In order to comply with the directional axis requirement of MIL-H-8501A, a significant increase in tail rotor thrust is required. The directional controllability characteristics are considered to be unacceptable, and correction is mandatory. With SCAS OFF, the aircraft reaction to a directional control step input was generally less than with SCAS ON.

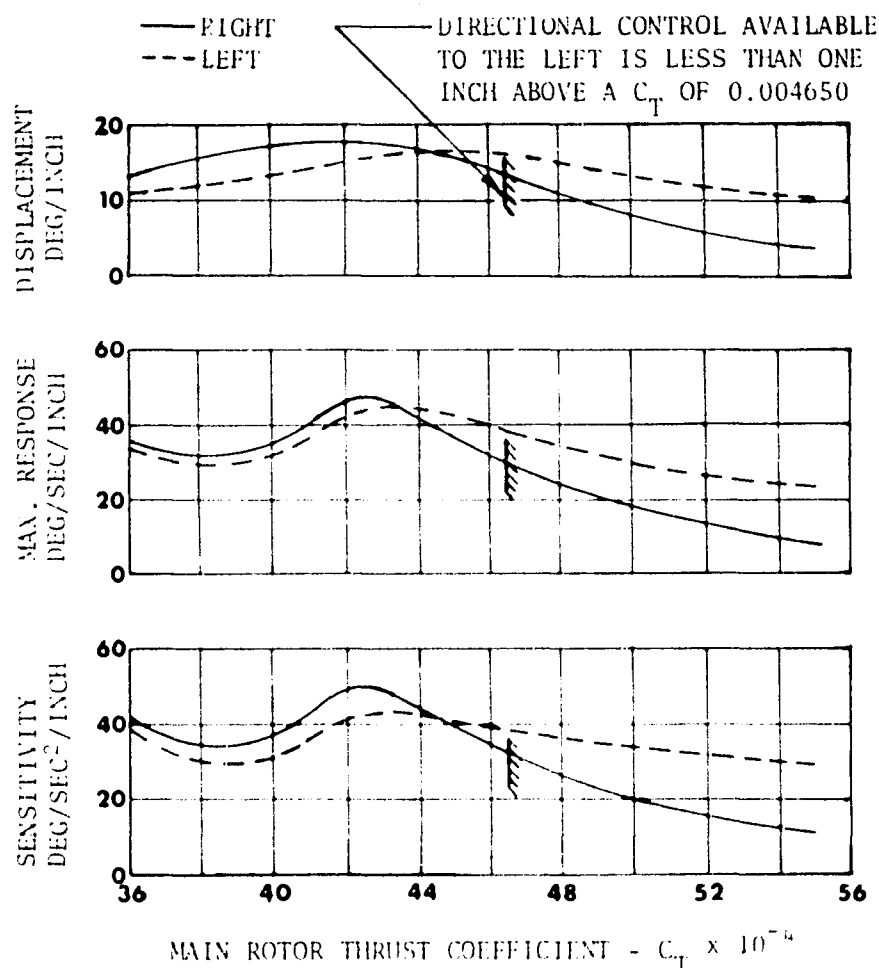


Figure R. Directional Hovering Controllability.

93. A related problem to the insufficient directional control problem is the tail rotor power transfer limitation discussed in paragraph 49. Tail rotor horsepower was measured for directional control inputs during most of the directional controllability testing. The change in tail rotor horsepower required to initiate a directional heading change was generally found to be a function of pedal input magnitude. Peak tail rotor horsepower encountered when arresting turns varied from 210 to 225 horsepower. The tail rotor horsepower required to arrest a turn rate was a function of the following parameters: yaw rate, yaw angular acceleration and rate of pedal control input. These high horsepower results in the unacceptable gear wear patterns of the 42- and 90-degree gear boxes as discussed in paragraph 49. Figures 287 through 289, appendix VII, present the tail rotor horsepower encountered during hover controllability tests.

94. The directional controllability of the AH-1G is poor and jeopardizes safe mission accomplishment where insufficient left directional control exists to either develop an adequate left yaw rate or to satisfactorily arrest a right yaw rate. For the C_T range where more than 10 percent of left directional control remains, an HQRS of 5 is assigned for the directional controllability in hover. For the C_T range where less than 10 percent of left directional control remains, an HQRS of 10 is assigned.

MANEUVERING STABILITY

95. Maneuvering stability tests were conducted to evaluate the longitudinal control characteristics of the AH-1G. The two techniques used during this test were wind-up turns and symmetrical pull-ups. For both techniques, the aircraft was first stabilized at a trim airspeed in level flight, and the collective and force trim settings were maintained throughout the maneuver. During the wind-up turns, the helicopter was stabilized at increasing increments of normal acceleration in a constant-airspeed, coordinated turn. During the symmetrical pull-ups, climbs and dives were performed establishing increasing increments of normal acceleration in a symmetrical pull-up as the helicopter passed through the level flight attitude at the trim airspeed and altitude. The aircraft was evaluated at two airspeeds: $0.8 V_H$ and V_H . The configurations tested were: clean wing, forward and aft cg loading at 7800 pounds and aft cg loading at 7000 pounds. The average density altitude for these tests was 5000 feet. The results of these tests are presented in figure 291, appendix VII. Also, a summary of the maneuvering stability is presented in figure 290.

96. The helicopter possessed positive maneuvering stability. As the load factor was increased, an increase in aft longitudinal force (pull) and aft longitudinal control position was required. Higher gradients were experienced at the forward cg loading than at the aft cg loading. Extrapolation of these data indicates that both the longitudinal control position gradient and longitudinal force gradient would be stable throughout the cg envelope of the aircraft. Increasing gross weight caused both the control position and force gradients to increase as did decreasing airspeed. No feedback was noticed in the cyclic control as was indicated in references 2 and 17, appendix I.

97. There was little or no lateral control variation from trim with increasing load factor during the symmetrical pull-ups. However, there was some right displacement of the lateral control from trim in the wind-up turns as load factor was increased. The magnitude of this right lateral control displacement was larger in wind-up turns to the right. The lateral control was approximately 1.0 inch from trim at the highest attained load factor. A summary of lateral control displacement during maneuvering stability tests is presented in figure 292, appendix VII. This lateral control migration with normal acceleration was not noticeable to the pilot. The maximum bank angles attained were 72 degrees (left bank) in a left wind-up turn and 68 degrees (right bank) in a right wind-up turn. These values were obtained at the light gross weight (7000 pounds) and aft cg loading. The maneuvering stability characteristics are rated highly desirable. The control position and force gradients were adequate and displayed no discontinuities. An apparent change in stick force per g caused some concern during high-speed, constant-g pullouts. When normal acceleration was maintained at 2g's or above during the pullout, the rapid decrease in airspeed during the maneuver resulted in a trim change which reduced the stick force noticeably. For trimmed dive conditions, a decrease of 50 to 60 knots in airspeed during a constant-g pullout reduced the stick force to approximately zero. This characteristic should be noted in the AH-1G operator's manual (ref 20, app 1) and should be considered in follow-on control system designs.

AIRCRAFT REACTION TO ENGINE FAILURE

98. The aircraft reactions following a sudden engine failure were evaluated to determine the adequacy of pilot cues, identify the recovery techniques required to establish autorotation and determine MIL-H-8501A compliance. Sudden engine failure was simulated by rapidly rotating the throttle to the ground idle position. All tests were initiated from stabilized wings-level flight. Following the simulated engine failure, all flight controls were held fixed for 2 seconds or until recovery was necessary to evaluate recognition cues, required pilot actions and effect of delay times. All tests were conducted with SCAS ON. Results of these tests are summarized in figures 293 through 297, appendix VII. Time histories of several simulated engine failures are presented in figures 298 through 301. Tests were conducted under conditions as shown in table 13, appendix VIII.

Aircraft Motions Following Simulated Engine Failures

99. The initial reaction of the aircraft following simulated engine failures was, for all cases, an immediate yaw to the left as the rotor rpm began to decrease. This was followed by a left roll. The initial yaw acceleration was a function of the engine torque at the instant of failure. A slight pitch-up tendency was controlled by the SCAS before being sensed by the pilot. The left roll induced by the left yaw reaction (dihedral effect) was slight at low speeds (60 to 80 KCAS) and was controlled by the lateral SCAS so that no roll rates were sensed by the pilot. At airspeeds greater than 80 KCAS, the roll rates saturated the lateral SCAS and resulted in increasing left roll rates with increasing airspeed. At approximately 120 KCAS with a cruise power setting, the roll rate reached 25 to 28 deg/sec in 2 seconds or less. Since the dihedral effect becomes greater with increasing airspeed, the time to reach the maximum acceptable roll rate (25 to 28 deg/sec) was decreased and reduced the time before recovery was initiated. At maximum airspeeds evaluated, the yaw/roll reaction became very severe. Heavy buffeting of the tail boom and vertical stabilizer was encountered at 170 KCAS with a 0.5-second delay.

Engine Failure Cues

100. The reactions and indications sensed by the pilot following sudden engine failure are strong and clear: audible (loss of engine noise, low rpm audio signal, change of rotor sound), visual (engine and rotor instruments, low rpm warning light, attitude change) and kinesthetic (yaw and roll accelerations).

Delay Time Evaluation

101. The time available for pilot recognition and reaction to sudden engine failure (delay time) was evaluated for all conditions. For each condition, the critical control input was determined. For full-power climbs at 65 KCAS, the delay time possible was greater than 2 seconds. Aircraft attitudes and rates were not objectionable during full-power climb, and controlling rotor rpm decay (approximately 27 rpm/sec) with the collective was the critical pilot action. For level flight conditions at, or near, the airspeed for minimum power required (65 to 75 KCAS) delays in excess of 2 seconds for all controls are possible. Aircraft attitude and rotor rpm decay were easily controlled. For all level flight conditions at airspeeds between 60 and 120 KCAS,

a 2-second delay on all controls was achieved. At approximately 120 KCAS, the maximum tolerable left roll rate (25 to 28 deg/sec) was reached and recovery action was required. As the airspeed was further increased, the maximum tolerable delay time on the cyclic and directional controls decreased. At 150 KCAS with the engine developing maximum power, recovery action (aft and right cyclic and right directional control) was required after approximately 1 second for all configurations and gross weights. At V_L (165 to 175 KCAS) for the minimum usable test altitude, the maximum delay time recorded was 0.7 second. Because of the severity of the aircraft reaction following sudden engine failure, the requirement for pilot response of less than 1 second is unacceptable. Qualitative results of other tests (ref 21, app 1) indicated that 1-second delays were acceptable at all airspeeds for engine torque settings less than 35 psi. Additional testing is necessary to quantitatively evaluate the effects of reduced engine power on simulated engine failure maneuvers.

Recovery Technique

102. The recovery technique following sudden engine failure was similar for all conditions. For the lower airspeeds (60 to 100 KCAS), only small cyclic inputs were required to control aircraft attitude, and a smooth lowering of the collective was adequate to control the rotor rpm decay and establish autorotation. At the higher airspeeds (100 KCAS to V_L), prompt control of the aircraft attitude (yaw and roll to the left) followed by a positive cyclic flare was essential. The cyclic flare reduced the rate of descent and checked rotor rpm decay rate while reducing the airspeed to the desired autorotation value. The collective was lowered smoothly after the flare was established so that the rotor rpm was in the normal range when the autorotational airspeed was reached.

Rotor RPM Decay Characteristics

103. The rotor rpm decay rate varied from 17 to 27 rpm/sec depending on the collective setting (or engine torque) at the time of simulated engine failure. Airspeed with R/C had no measurable effect on the decay rate (figs. 293 through 297, app VII). Minimum rotor speeds of 260 to 280 rpm were common for delay times of 2 seconds. The lowest rotor rpm encountered during the tests was 249 rpm for a 1.8-second delay at 120 KCAS at 10,000 feet. The rotor rpm responded quickly to recovery action by the pilot.

Effects of Gross Weight, Center of Gravity, Density Altitude and Wing-Stores Configuration

104. The aircraft reactions following a simulated engine failure were basically similar for all conditions tested. The aircraft reaction to failure at light grwt was quicker than at heavy grwt. The aircraft response to control inputs and susceptibility to control feedback were less during aircraft recovery at light grwt. The aircraft reactions at the medium grwt (8500 pounds) was less objectionable than either the heavy grwt (9500 pounds) or light (7500 pounds) grwt. Maximum rotor loading (gross weight times normal acceleration) was more difficult to attain at light weight; and, consequently, the maximum rotor speeds attainable during aircraft recovery were much lower (300 to 310 rpm). The reactions with forward cg loadings were more objectionable due to the increased nose-down attitude at the high airspeeds and the reduced amount of aft cyclic control available to effect recovery. Density altitude effects were not significant since the more critical high airspeeds were beyond the envelope limits. The external stores configurations tested (clean and four XM159 rocket pods installed) were not noticeably different.

Effects of Landing Gear Cross-Tube Fairings Removed

105. Reactions of the AH 1G following sudden engine failure were also evaluated with landing gear cross-tube fairings removed. No significant differences in the aircraft reactions were observed at airspeeds less than 160 KCAS: the maximum permitted airspeed for this configuration.

Limitations

106. The following characteristics and reactions were encountered which limited the testing and are the basis for operational limitations:

- a. Unacceptable left roll rates encountered at the high-speed, high-power conditions with a marginally acceptable pilot recognition and reaction time of 1 second.
- b. Heavy buffeting of the tail boom and vertical fin, at or near the limit airspeed conditions, following simulated engine failures at high-power settings.
- c. Heavy control feed-back during recovery from high-speed, simulated engine failures where the maximum tolerable aircraft attitudes and rates were recorded.

d. Large main rotor flapping angles (70 percent of total available before hub and mast contact) were recorded during limit condition recoveries. The magnitude of the main rotor flapping angle can be increased to a dangerous level by lowering the collective before a positive flare and a resultant increased normal acceleration is established.

107. To limit the operation of the AH-1G at conditions where the reactions following sudden engine failure are unacceptable, the following should be accomplished:

a. Limit indicated engine torque to 35 psi for dive airspeeds greater than 150 KCAS.

b. Mark all airspeed indicators with yellow caution ARC between 150 and 190 knots.

c. Mark all torqueometers with a yellow caution stripe at 35 psi.

d. Revise paragraphs 4-15 through 4-25, 7-17, 8-26 and 8-38 of the AH-1G pilot's handbook (ref 20, app 1) in accordance with the preceding discussion.

MISCELLANEOUS

Trim Change Accompanying SCAS Disengagement

108. Tests were conducted to evaluate the aircraft reactions following SCAS disengagement. These tests were conducted at trim airspeeds between 55 KCAS and V_L in the heavy hog configuration. In all cases tested, the aircraft reacted with a gradual nose-up pitching motion and a slight right roll when SCAS was disengaged. The rates observed were very small and did not exceed the requirement of paragraph 3.5.9(a), MIL-H-8501A. No significant aircraft reaction was observed during subsequent SCAS reengagement during trimmed, stabilized flight. It is most probable that SCAS disengagement in stabilized flight would initially be undetected by the pilot except for the illumination of the appropriate warning lights and the decrease in aircraft dynamic stability as discussed in paragraph 57. The aircraft reactions following SCAS "hardovers" were not investigated during these tests. The results of the contractor in-flight SCAS qualification tests are presented in reference 22, appendix I.

SCAS Pylon Coupling

109. SCAS pylon coupling was not encountered during the Phase D program. This would indicate that the problem previously encountered during Phase B testing (ref 2, app 1) had been alleviated. However, a small amount of undamped aircraft motion was encountered at maximum power settings (topping power). These small, but annoying aircraft oscillations were probably due to engine oscillation and not SCAS pylon coupling. These oscillations were eliminated by reducing engine output power slightly below topping power.

Airspeed Calibration

110. Airspeed calibration tests were conducted to determine the position error of the standard and test (boom) airspeed systems in climbing, diving, autorotational and level flight. The methods used to calibrate the test airspeed system were a combination of the trailing bomb, paper aircraft and ground speed course. The calibration was conducted in the clean configuration only, and the data are presented in figures 302 through 304 appendix VII.

111. The standard airspeed system was calibrated using the trailing bomb and paper aircraft methods, and the results are presented in figure 299, appendix III. In addition to the data gathered during this evaluation, the test results include data from the AH-1G Phase B test reports (ref 2, 3 and 4, app 11). The test configurations were clean, basic and outboard alternate. The position error in climbing and autorotational flight was less than 3 knots from 35 to 190 knots indicated airspeed (KIAS) and was acceptable. This airspeed band includes the airspeed for maximum glide. Higher position errors were present from 30 to 55 KIAS, but these errors are not deemed significant since the helicopter is normally accelerating or decelerating through this airspeed band.

112. The standard airspeed system calibration for level and diving flight was compared to the position errors listed in the operator's manual (ref 18, app 1). This comparison is presented in figure 8 and shows essentially the same position error from 40 to 170 KIAS. For the airspeed ranges from 30 to 40 KIAS and 170 to 190 KIAS, there is a difference of 2 knots or less between the two sources of data. The airspeed position errors determined during this test are satisfactory for the aircraft's mission and should be incorporated into the operator's manual.

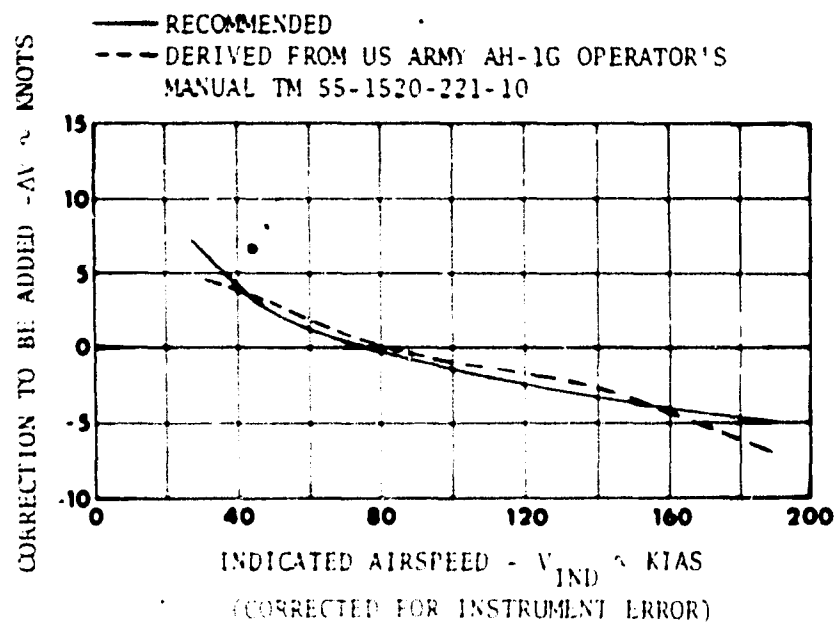


Figure S. Standard Airspeed System Calibration.

CONCLUSIONS

GENERAL

113. The handling qualities of the AH-1G are acceptable throughout the published flight envelope except for the deficiencies as listed in paragraph 118.

114. The deviation from MIL-H-8501A referred to in the AH-1G contract pertaining to the lateral-directional handling qualities does not establish adequate alternate standards for design or evaluation (paras 34 and 40).

115. A directional control margin of 10-percent total pedal travel is the minimum acceptable for operating the AH-1G (para 42).

116. The dynamic stability handling qualities of the AH-1G are unacceptable at airspeeds in excess of 160 KCAS with the landing gear cross-tube fairings removed and with the SCAS ON (paras 60 and 83).

117. The dynamic stability handling qualities of the AH-1G are unacceptable at airspeeds in excess of 115 KCAS with the landing gear cross-tube fairings removed and with the SCAS inoperative (para 61).

DEFICIENCIES AND SHORTCOMINGS AFFECTING MISSION ACCOMPLISHMENT

118. Correction of the following deficiencies is mandatory for successful accomplishment of the intended mission:

- a. The excessive cyclic control breakout forces (para 17).
- b. Inadequate directional control (paras 43 through 46).
- c. Inability to achieve maximum tail rotor blade angle (19 degrees) when full directional control is applied for all conditions with the present directional control/yaw SCAS geometry (para 47).
- d. The excessive tail rotor horsepower required for hovering and translational flight (paras 49, 91 and 93).

119. Correction of the following shortcomings is desirable for successful accomplishment of the intended mission:

- a. Neutral static longitudinal stability at airspeeds approaching V_L (para 28).
- b. Increase in right directional control with increasing airspeed in dive (paras 26 and 31).
- c. Directional instability between 10 and 19 knots at relative wind azimuths between 210 and 230 degrees (para 48).
- d. The poor longitudinal dynamic stability characteristics with the SCAS not operating (para 54).
- e. The decrease in lateral-directional damping with the SCAS OFF (para 57).

MILITARY SPECIFICATION COMPLIANCE

120. All stability and control handling qualities specified in reference 12, appendix I, are complied with except for the following paragraphs of MIL-H-8501A (not including paras 3.3, 3.6 and 3.7).

<u>Paragraph</u>	<u>Item</u>
3.2.10	Neutral static longitudinal stability at airspeeds above 170 KCAS.
3.2.4	Longitudinal breakout force is greater than the force gradient required to produce the first inch of longitudinal control displacement from trim.
3.2.7	Longitudinal breakout forces in excess of approved deviation from MIL-H-8501A.
3.5.4.1	Insufficient directional control to perform vertical climb throughout present flight envelope.
3.5.5 and 3.5.5.1	Insufficient time to recognize and institute corrective action following engine failure within the present flight envelope.
3.5.4.3, 3.5.4.4 and 3.5.4.5	Tests not conducted to check compliance.

121. All portions of paragraph 3.3 of MIL-H-8501A were met except the following. The contractor was not obligated to meet the following portions of MIL-H-8501A:

<u>Paragraph</u>	<u>Item</u>
3.3.2, 3.3.3, 3.3.5 and 3.3.6	Insufficient directional control during translational flight.
3.3.9	Neutral dihedral effect in autorotation.
3.3.11	Lateral breakout forces greater than the force gradient to produce the first inch of longitudinal control displacement from trim.
3.3.13	Lateral breakout forces in excess of approved deviation from MIL-H-8501A.
3.3.15	Angular roll rate is greater than 20 degrees/second/inch for some flight conditions.

RECOMMENDATIONS

122. The handling qualities and flight envelope limitations presented in this report are recommended for inclusion in the operator's manual.

123. Correct deficiencies on a priority basis.

124. Correct shortcomings at the earliest convenience.

125. Restrict the operational flight envelope to conditions which provide a 10-percent directional control margin (para 42).

126. Initiate action to increase directional control margins and improve the torque transfer capability of the tail rotor drive system (paras 46 and 49).

127. Revise deviation 1 of MIL-H-8501A granted in the AH-1G contract, pertaining to the lateral-directional handling qualities, to include adequate standards for design and evaluation (para 34).

128. Incorporate the following flight envelope limitations:

a. Limit airspeed to 160 KCAS (SCAS ON) and 115 KCAS (SCAS OFF) when landing gear cross-tube fairings are not installed (paras 60, 61 and 83).

b. Mark airspeed indicators (pilot and copilot) with a yellow caution arc between 150 KIAS and limit airspeed (para 107).

c. Mark engine torque meters (pilot and copilot) with a yellow stripe at 35 psi (para 107).

d. Mark airspeed indicators (pilot and copilot) with a yellow caution arc between 150 KIAS and limit airspeed (para 107).

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15. Proposed Military Specification, MIL-H-8501B, *Helicopter Flying and Ground Handling Qualities; General Requirements For*, 3 June 1967.
16. Technical Manual, TM 55-1520-221-20, *AH-1G Helicopter Organizational Maintenance Manual*, April 1967.
17. Final Report, USAAVNTA, Project No. 65-30, *Engineer Evaluation of the Bell Model 209 Armed Helicopter*, May 1966.
18. Report, Bell Helicopter Company, 209-099-050, *Basic Structural Design Criteria for the AH-1G Tactical Helicopter*, June 1, 1966.
19. Final Report, USAASTA, Project No. 66-06, *Engineering Flight Test, AH-1G Helicopter, HueyCobra, Phase D, Part 2, Performance*, April 1970.
20. Technical Manual, TM 55-1520-221-10, *AH-1G Operator's Manual*, April 1967.
21. Final Report, USAASTA, Project No. 69-01, *Airworthiness and Flight Characteristics Test, AH-1G Helicopter with Stabilized Night Sight (SNS), Phase II*, August 1970.
22. Report, Bell Helicopter Company, 209-099-034, *Qualification of the 570 Stability Augmentation System, Model AH-1G Helicopter*, 6 June 1967.

APPENDIX II. BASIC AIRCRAFT INFORMATION AND OPERATING LIMITS

AIRFRAME

Rotor System

The 540 "door hinge" main rotor assembly is a two-bladed, semi-rigid, underslung feathering axis type rotor. The assembly consists basically of two all-metal blades, blade grips, yoke extensions, yoke trunnion, and rotating controls. Control horns for cyclic and collective control input are mounted on the trailing edge of the blade grip. Trunnion bearings permit rotor flapping. The blade grip to yoke extension bearings permit cyclic and collective pitch action.

Tail Rotor

The tail rotor is a two-bladed, delta-hinge type employing pre-coning and underslinging. The blade and yoke assembly is mounted to the tail rotor shaft by means of delta-hinge trunnion. Blade pitch angle is varied by movement of the tail rotor control pedals. Power to drive the tail rotor is supplied by a takeoff on the lower end of the main transmission.

Transmission System

The transmission is mounted forward of the engine and coupled to the engine by a short drive shaft. The transmission is basically a reduction gear box which transmits engine power at reduced rpm to the main and tail rotors by means of a two-stage planetary gear train. The transmission incorporates a free-wheeling unit at the input drive. This provides a disconnect from the engine in case of a power failure to allow the aircraft to make an autorotational landing.

Synchronized Elevator

The synchronized elevator, which has an inverted airfoil section, is located near the aft end of the tail boom and is connected by control tubes and mechanical linkage to the fore and aft cyclic control system. Fore and aft movements of the cyclic control stick produce a change in the synchronized elevator attitude.

Control Systems

A dual hydraulic control system is provided for the cyclic and collective controls. The directional controls are powered by a single servo cylinder which is operated by system No. 1. The hydraulic system consists of two hydraulic pumps, two reservoirs, relief valves, shut-off valves, pressure warning lights, lines, fittings, and manual, dual tandem, servo actuators incorporating irreversible valves. Tandem power cylinders incorporating closed center four-way manual servo valves and irreversible valves are provided in the lateral, fore and aft cyclic and collective control system. A single power cylinder incorporating a closed center four-way manual servo valve is provided in the directional control system. The cylinders contain a straight-through mechanical linkage.

Force Trim

A magnetic brake and force gradient device is incorporated in the cyclic control and directional pedal controls. These devices are installed in the flight control system between the cyclic stick and the hydraulic power cylinders and between the directional pedals and the hydraulic power cylinder. The force trim control can be turned off by depressing the left button on the top of the cyclic stick. The gradient is accomplished by springs and magnetic brake release assemblies which enable the pilot to trim the controls as desired.

Cyclic Control Stick

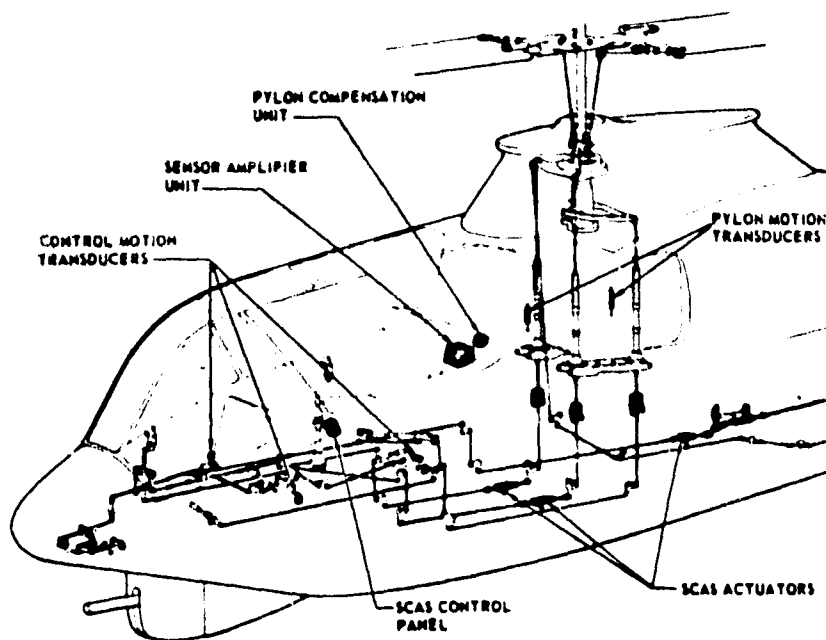
The pilot and gunner cyclic stick grip each have a force trim switch and a SCAS release switch. The pilot's cyclic stick has a built-in operating friction. The cyclic control movements are transmitted directly to the swash plate. The fore and aft cyclic control linkage is routed from the cyclic stick through the SCAS actuator, to the dual boost hydraulic actuator and then to the right horn of the fixed swash plate ring. The lateral cyclic is similarly routed to the left horn.

Collective Pitch Control

The collective pitch control is located to the left of the pilot and is used to control the vertical mode of flight. Operating friction can be induced into the control lever by hand tightening the friction adjuster. The pilot and gunner collective pitch controls have a rotating grip-type throttle.

Tail Rotor Pitch Control Pedals

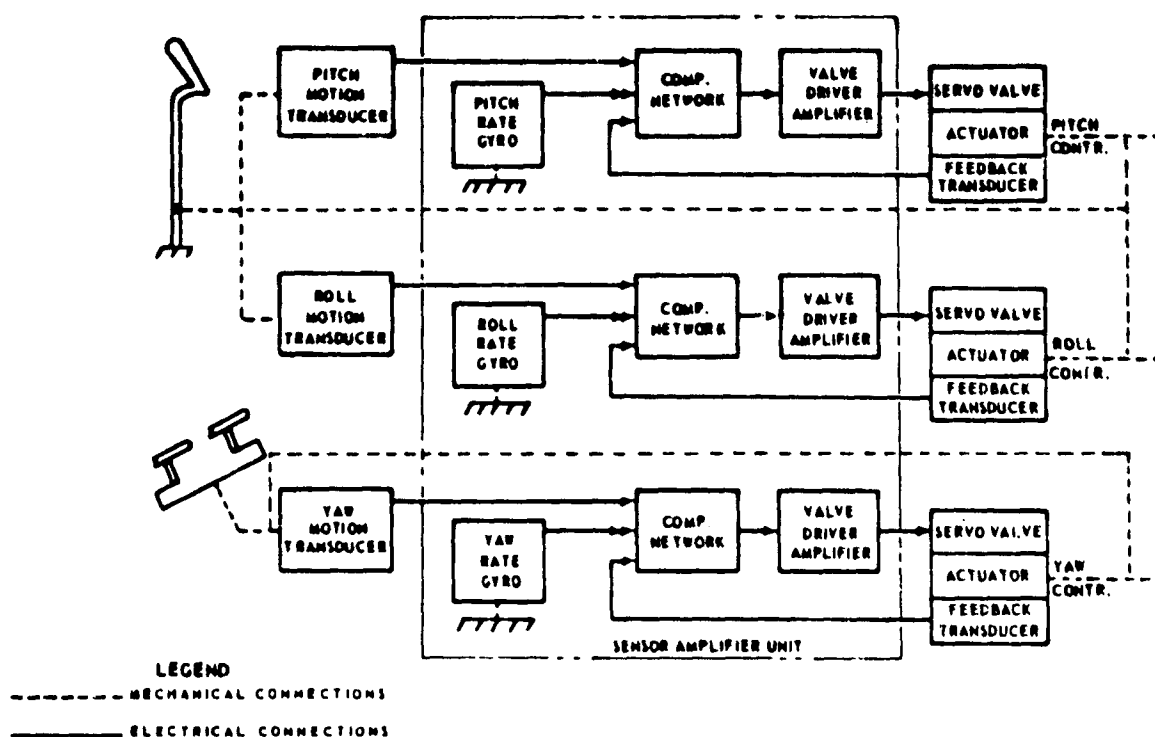
Tail rotor pitch control pedals alter the pitch of the tail rotor blades and thereby provide the means for directional control. The force trim system is connected to the directional controls and is operated by the force trim switch on the cyclic control grip.



Flight Controls Schematic

Stability and Control Augmentation System (SCAS)

The SCAS is a three-axis, limited-authority, rate-referenced stability augmentation system. It includes an electrical pilot input which augments the pilot's mechanical control input. This system permits separate consideration of airframe displacements caused by external disturbances from displacements caused by pilot input. The SCAS is integrated into the fore, aft, lateral and directional flight controls to improve the stability and handling qualities of the helicopter. The system consists of electro-hydraulic servo actuators, control motion transducers, a sensor/amplifier unit and a control panel. The servo actuator movements are not felt by the pilot. The actuators are limited to a 25-percent authority and will center and lock in case of electrical and/or hydraulic failure.



Interrelation of SCAS Components

ENGINE

Engine Description

The T53-L-13 engine, rated at 1400 shp, is a successor to the T53-L-11 engine. The additional power has been achieved with no change in the basic T53-L-11 engine envelope mounting and connection points and with a 6-percent increase in basic engine weight.

The performance gain is accomplished thermodynamically by the mechanical integration of a modified axial compressor, a two-stage compressor turbine and a two-stage power turbine into the T53-L-11 engine configuration.

Replacement of the first two compressor stators and changing of the first two stages of compressor rotor blades and disks results in an approximate 20-percent increase in mass air flow through the engine. This is accomplished without the use of inlet guide vanes.

An inlet flow fence, located on the outer wall of the inlet housing in the area of the previously used inlet guide vanes, provides the desired inlet conditions for the transonic compressor during acceleration at low speeds. At compressor speeds up to 70 percent, the

fence is in the extended position. Above 70 percent, the flow fence is retracted into the outer wall of the inlet housing. Similar to a piston ring, the circumference of the flow fence is changed by the action of a piston actuator powered by compressor discharge pressure.

The specification for this engine allows the use of JP-4 or JP-5 type fuel for satisfactory operation throughout the engine's operating envelope. During this program, JP-4 fuel was used.

Engine Power Control System

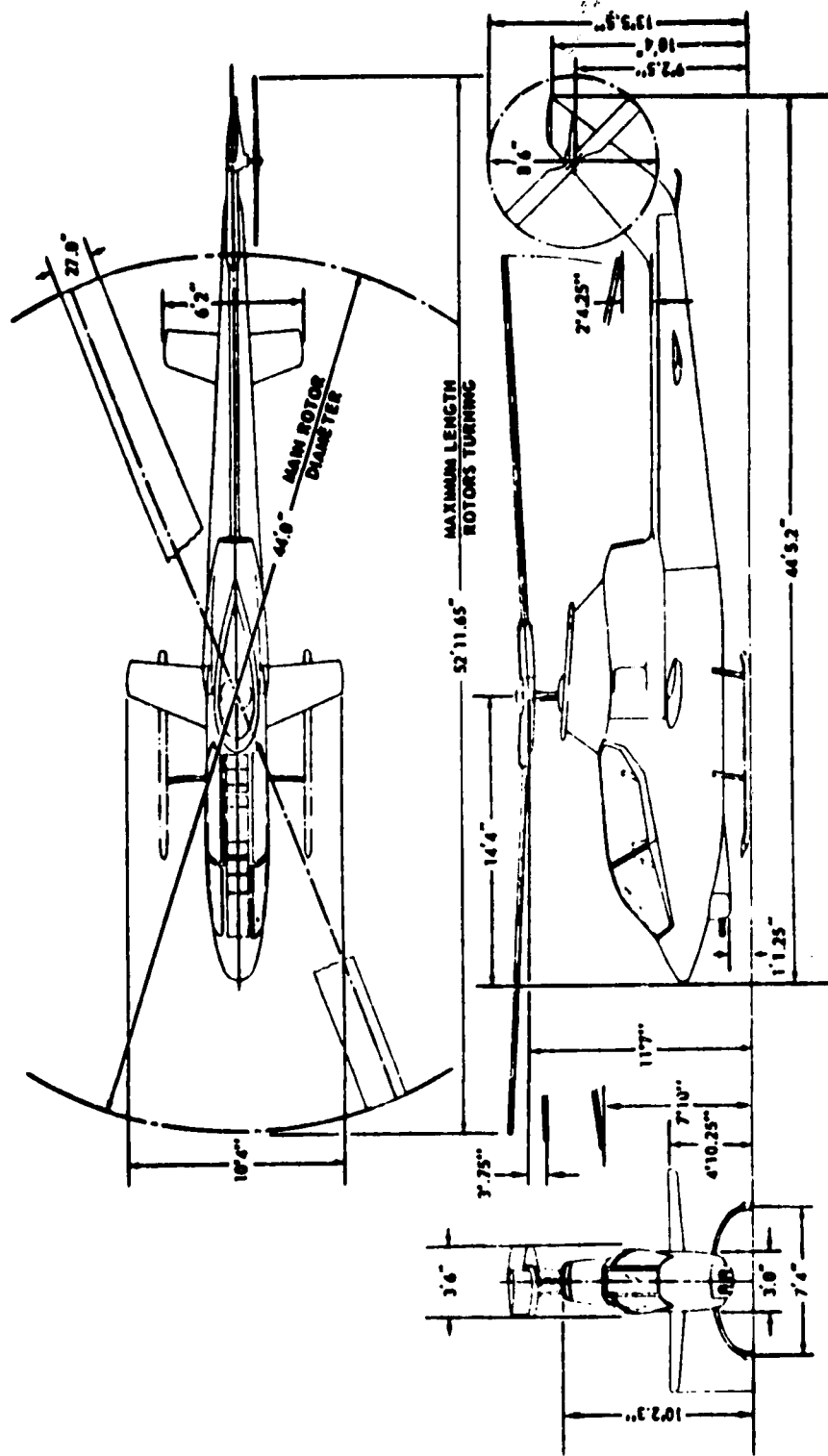
The fuel control for the T53-L-13 engine is a hydro-mechanical type of fuel control. It consists of the following main units:

- a. Dual-element fuel pump.
- b. Gas producer speed governor.
- c. Power turbine speed topping governor.
- d. Acceleration and deceleration control.
- e. Fuel shut-off valve.
- f. Transient air bleed control.

An air bleed control is incorporated within the fuel control to provide for opening and closing the compressor interstage air bleed in response to the following signals present in the power control:

- a. Gas producer speed.
- b. Compressor inlet air temperature.
- c. Fuel flow.

The fuel control is designed to be operated either automatically or in an emergency mode. In the emergency position, fuel flow is terminated to the main metering valve and is routed to the manual (emergency) metering and dump valve assembly. While in the emergency mode, fuel flow to the engine is controlled by the position of the manual metering valve which is directly connected to the power control (twist grip). During the emergency operation, there is no automatic control of fuel flow during acceleration and deceleration; thus, EGT and engine acceleration must be pilot-monitored.



Three-view drawing - AH-1G

BASIC AIRCRAFT INFORMATION

Airframe Data

Overall length (rotor turning)	637.2 inches
Overall width (rotor trailing)	124.0 inches
Center line of main rotor to center line of tail rotor	320.7 inches
Center line of main rotor to elevator hinge line	198.6 inches
Elevator area (total)	15.2 square feet
Elevator area (both panels)	10.9 square feet
Elevator airfoil section	Inverted Clark Y
Vertical stabilizer area	18.5 square feet
Vertical stabilizer airfoil section	Special camber
Vertical stabilizer aerodynamic center	FS 499.0
Wing area:	
Total	27.8 square feet
Outboard of BL 18.0 (both sides)	18.5 square feet
Wing span	10.33 feet
Wing airfoil section:	
Root	NACA 0030
Tip	NACA 0024
Wing angle of incidence	14 degrees

Main Rotor Data

Number of blades	2
Diameter	44 feet
Disc area	1520.5 square feet
Blade chord	27 inches
Rotor solidity	0.0651
Blade area (both blades)	99 square feet
Blade airfoil	9.33 percent symm special section
Linear blade twist	-0.455 deg/ft
Hub precone angle	2.75 degrees
Main rotor inertia	2900 slugs-ft ²

Antitorque Rotor Data

Number of blades	2
Diameter	8.5 feet
Disc area	56.74 square feet
Blade chord	8.41 inches
Rotor solidity	0.105
Blade airfoil	NACA 0010 modified
Blade twist	Zero degrees

For this test, the AH-1G with skid gear fairings removed: same as standard configurations (Normal limit for operational use: 160 KCAS)

All other configurations: 190 KCAS below a 4000-foot density altitude; decrease 8 KCAS per 1000 feet above 4000 feet

Gross Weight/Center of Gravity Envelope

Forward center of gravity limit: Below 7000 pounds, FS 190.0; linear increase to FS 192.1 at 9500 pounds

Aft center of gravity limit: Below 8270 pounds, FS 201.0; linear decrease to FS 200 at 9500 pounds

Sideslip Limits

Five degrees at V_L with linear increase to 20 degrees at 60 KCAS

Rotor and Engine Speed Limits (Steady State)

Power on:

Engine rpm	6400 to 6600
Rotor rpm	314 to 324

Power off:

Rotor rpm	294 to 339
Rotor rpm transient lower limit	250

Power on during dives and maneuvers:

Rotor rpm	314 to 324
-----------	------------

Temperature and Pressure Limits

Engine oil temperature	93°C
Transmission oil temperature	110°C
Engine oil pressure	25 to 100 psi
Transmission oil pressure	30 to 70 psi
Fuel pressure	5 to 20 psi

T53-L-13 Engine Limits

Normal rated EGT (maximum continuous)	625°C
Military rated EGT (30-minute limit)	645°C
Starting and acceleration EGT (5-second limit)	675°C
Maximum EGT for starting and acceleration	760°C
Torque pressure limit	50 psi

Transmission Drive System Ratios

Engine to main rotor	20.383:1.0
Engine to antitorque rotor	3.990:1.0
Engine to antitorque drive system	1.535:1.0

Test Aircraft (S/N 6615247) Control Displacements

Longitudinal cyclic control:	
Full forward to full aft with SCAS nulled	9.07 inches
Lateral cyclic control:	
Full left to full right with SCAS nulled	10.00 inches
Directional (pedal) control:	
Full left to full right with SCAS nulled	7.07 inches
Collective control:	
Full up to full down with SCAS nulled	9.30 inches

Test Aircraft (S/N 6615247) SCAS Authority

Longitudinal SCAS authority:
 ± 12.5 percent or ± 1.13 inches of longitudinal
 cyclic control displacement

Lateral SCAS authority:
 ± 12.5 percent or ± 1.25 inches of lateral
 cyclic control displacement

Directional SCAS authority:
 ± 12.5 percent or ± 0.88 inch of directional
 (pedal) control displacement

Test Aircraft (S/N 6715695) Control Displacements

Longitudinal cyclic control:	
Full forward to full aft with SCAS nulled	10.08 inches
Lateral cyclic control:	
Full left to full right with SCAS nulled	9.90 inches
Directional (pedal) control:	
Full left to full right with SCAS nulled	5.97 inches
Collective control:	
Full up to full down with SCAS nulled	8.98 inches

Test Aircraft (S/N 6715695) SCAS Authority

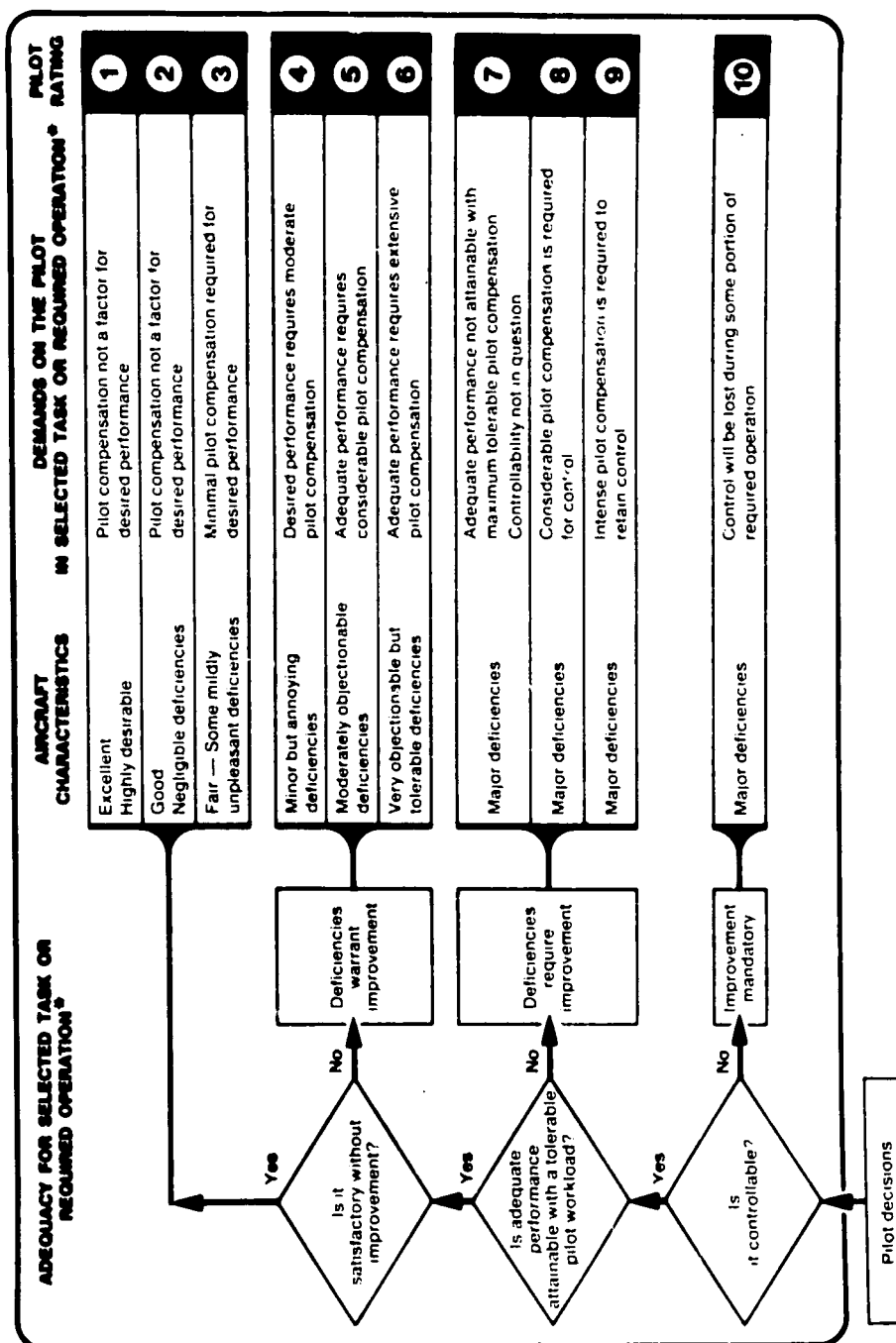
Longitudinal SCAS authority:	
±12.5 percent or ±1.26 inches of longitudinal cyclic control displacement	
Lateral SCAS authority:	
±12.5 percent or ±1.24 inches of lateral cyclic control displacement	
Directional SCAS authority:	
±12.5 percent or ±0.75 inch of directional (pedal) control displacement	

OPERATING LIMITATIONS

Limit Airspeed (V_L)

Any configuration with XM159 rocket pods: 180 KCAS below a 3000-foot density altitude; decrease 8 KCAS per 1000 feet above 3000 feet

APPENDIX III. HANDLING QUALITIES RATING SCALE



APPENDIX IV. TEST TECHNIQUES AND DATA REDUCTION PROCEDURES

INTRODUCTION

Nondimensional Method

1. Tests were flown at different combinations of gross weight and density altitude to determine if variation in these parameters caused a change in handling qualities. Correlation of these data were accomplished by summarizing the data as a function of main rotor thrust coefficient where applicable. Each individual test flight was flown at a constant main rotor thrust coefficient (C_T). A constant C_T was maintained by either increasing altitude as fuel was consumed (for flights conducted at altitude) or adding ballast to the aircraft as fuel was consumed (for flights conducted in ground effect). The equation used to determine the nondimensional main rotor thrust coefficient was:

$$\text{Thrust coefficient} = C_T = \frac{\text{GRWT}}{A (AR)^2} \quad (1)$$

Instrumentation

2. All instrumentation in both aircraft was calibrated prior to commencing the test program. All quantitative data obtained during this flight test program were derived from special sensitive instrumentation. A detailed tabulation of the instrumentation is given in appendix V. Data were obtained from four aircraft sources and two ground support sources. The aircraft sources were: oscillograph, photopanel, pilot's panel (hand recorded), and engineer's panel (hand recorded). The ground support sources were: ground station and ground speed reference vehicle.

Weight and Balance

3. A high degree of control was maintained on weight and balance of the test helicopter. Variations in empty weight and cg, because of changes in helicopter component instrumentation, were defined by periodically weighing the helicopter.

4. The empty weight of test aircraft, S/N 615247, in the clean configuration without instrumentation installed could not be determined since the aircraft was partially instrumented when it was delivered to USAASTA at the beginning of the program. In addition, the aircraft

was not a production model and was not representative of a standard AH-1G. The empty weight of test aircraft, S/N 715695, in the clean configuration without instrumentation installed was 5805 pounds, and the longitudinal cg was 201.4 inches. This aircraft is considered to be representative of the production model aircraft. This weighing was performed with following conditions prevailing: engine and transmissions full of oil, trapped fuel not drained, ammunition boxes with covers and ammunition chutes installed for chin turret, four wing store pylon stations installed, air conditioning system not installed and weight and center of gravity adjusted for removal of jack pads. The fuel load of the aircraft was defined by measuring the fuel specific gravity and temperature after each fueling and by using an external sight gage on the calibrated fuel cell to determine fuel volume. Fuel used in flight was recorded by a calibrated fuel-used system, and the results were cross-checked with the sight gage reading following each flight. Helicopter loading and cg were controlled by using ballast.

Flight Control Systems

5. Control breakout forces, control force gradients and control force friction band were measured on the ground with the rotor in a static position. Hydraulic pressure and electrical power were supplied by ground support equipment during these tests. Breakout forces and control force characteristics were determined by using an electrical strain gage bridge mounted in the appropriate location on each control. The control was displaced from the trim condition at a rate of 0.1 to 0.2 inch/second. A continuous record of control position and control force was made during the test. The breakout forces and control force friction band were also checked during flight.

STATIC STABILITY CHARACTERISTICS

Static Trim Stability

6. The static trim stability was investigated using the following technique. The helicopter was trimmed at various airspeeds (minimum of 5 points) over an airspeed range. The range of the airspeed flown for each flight condition depended on density altitude, gross weight and cg. While the aircraft was stabilized at each trim airspeed, all control forces, control positions and aircraft attitudes were recorded. Altitude was varied during each test flight to maintain a constant thrust coefficient for each trim airspeed.

Static Longitudinal Collective-Fixed Stability

7. The static longitudinal collective-fixed stability was investigated using the following method. The aircraft was first stabilized at the desired trim conditions. The helicopter was then stabilized at several airspeeds greater and less than the trim airspeed in ascending or descending flight. The airspeed was then varied by use of the longitudinal control. The trim collective control position, control trim force position and trim engine power were maintained as airspeed was varied about each trim airspeed. At each stabilized point the control positions, control forces and aircraft attitudes were recorded. Altitude was varied as fuel was consumed during each test flight to maintain a constant thrust coefficient for each trim airspeed.

Static Directional Stability and Effective Dihedral

8. The static directional stability and effective dihedral tests were conducted using the following technique. The aircraft was first stabilized at a trim airspeed at or near zero angle of sideslip. Sideslip angle was then varied and stabilized at different values (left or right of trim) until the limits of the sideslip envelope were achieved. The trim collective control position, control trim force position and trim airspeed were held constant as angle of sideslip was varied about each trim condition. At each stabilized point control positions, control forces and attitudes were recorded. Altitude was varied as fuel was consumed during each test flight to maintain a constant thrust coefficient for each trim airspeed.

Translational Flight Handling Qualities Evaluation

9. The translational handling qualities were investigated by conducting tests at various combinations of wind azimuth and airspeed. When the aircraft was stabilized in translational flight, parameters necessary to determine gross weight, ambient air conditions, azimuth, airspeed and directional control (pedal) with SCAS in nulled position were recorded. A ground vehicle with a calibrated speedometer was used as a reference when attempting to stabilize the helicopter at the desired airspeed and azimuth. Ambient wind velocity and direction were incorporated into the analysis when determining the airspeed and wind azimuth. Tests were conducted with wind velocities less than 4 knots. A constant thrust coefficient was maintained for each test condition by adding ballast as fuel was consumed.

Dynamic Stability

10. Dynamic stability characteristics of the AH-1G were tested by using the following techniques. The aircraft was first trimmed at the desired flight condition and airspeed. Gust disturbances were then simulated by making pulse-type control inputs of 1 inch for 0.5 to 1.0 second. The control was then returned to trim at which time all controls were held fixed until the aircraft motions damped out or recovery action was required. All resulting aircraft motions, as well as the control input, were recorded on the oscillograph. Altitude was varied as fuel was consumed during each test flight to maintain a constant thrust coefficient for each trim airspeed. Oscillations were evaluated by determining the resultant damping ratio and damped natural frequency. Times for the aircraft oscillations to damp were obtained from the timing lines on the oscillograph. The damped natural frequency and the damping ratio were derived for all conditions tested by two methods. These were the logarithmic decrement method and time ratio method.

11. The logarithmic decrement method was used for lightly damped to unstable aircraft motion. The range of damping ratios determined by this method was from -0.5 to +0.5. The damping ratio is a function of the amplitude and the damped natural frequency is a function of the period.

$$\ln \frac{x_m}{x_0} = - \frac{\pi m \zeta}{\sqrt{1 - \zeta^2}} \quad (2)$$

$$\omega_d = \frac{2\pi}{P} \quad (3)$$

12. The time ratio method was used to analyze the heavily damped aircraft motion which was usually characterized by one excursion from trim. The range of damping ratios determined by this method was from 0.5 to 1.8. Anything more heavily damped than 1.8 was considered "deadbeat," and no accurate means was available to determine either damping ratio or undamped natural frequency. When using the time ratio method, the undamped natural frequency was determined by the damping ratio and the damped natural frequency by means of the following formula:

$$\omega_d = \omega_n \sqrt{1 - \zeta^2} \quad (0 < \zeta < 1) \quad (4)$$

$$\omega_d = \omega_n \sqrt{\zeta^2 - 1} \quad (\zeta > 1) \quad (5)$$

13. Each flight condition was given a description as far as the kind of damping characteristic that it represented. These descriptions along with the damping ratio range are listed below:

<u>Description</u>	<u>Damping Ratio Range</u>
Negatively damped	$\zeta < 0$
Neutrally damped	$\zeta = 0$
Lightly damped	$\zeta = 0.1 \text{ to } 0.4$
Heavily damped	$\zeta = 0.5 \text{ to } 1.8$
Dead beat	$\zeta > 1.8$

Controllability

14. Aircraft controllability characteristics were investigated using the following technique. The aircraft was first stabilized at the desired flight condition and airspeed. Step-type control inputs were then initiated and held until the maximum rate was reached or recovery action was necessary. The magnitude of these step-type control inputs was varied (usually a minimum of 2 inputs in each direction) until a maximum control displacement of approximately 1.0 inch was realized. An adjustable, rigid control fixture was used to assist in achieving the desired inputs. Resultant aircraft motions as well as the control input were recorded on the oscillograph. The maximum angular accelerations were derived by differentiating the rate trace at the inflexion point.

Airspeed Calibration

15. The test airspeed indicator system (boom) and standard airspeed system were calibrated by comparing readings to a known reference. A calibrated trailing bomb was suspended from the helicopter with a cable approximately 50 feet in length. The aircraft was then stabilized at various airspeeds in level flight, climb and autorotation. By comparing the airspeed, corrected for instrument errors, of both systems to the bomb system, the error was defined.

16. The test boom airspeed indicator system was calibrated at higher airspeeds, both in level flight and dive using a T-28 pacer aircraft. The test and pacer aircraft were stabilized at the same airspeed, and data were recorded in each aircraft simultaneously. Since the position error of the pacer was known, the calibrated airspeed of the aircraft was readily computed.

17. The test boom airspeed indicator system was calibrated in level flight over a measured ground course. Two passes were flown on reciprocal headings at each airspeed to average wind effects. This method provided a cross-check on the trailing bomb method described in paragraph 15.

18. The test airspeed system consisted of a boom with a non-swiveling pitot-static head mounted just aft and below the nose of the aircraft. This pitot-static system was connected to the sensitive airspeed and altimeter indicators on various instrument panels. This system was used in place of the standard pitot-static system since the standard system was not accurate when both systems were installed on the aircraft.

APPENDIX V. TEST INSTRUMENTATION

USA S/N 6715695

All instrumentation was installed in the test helicopter prior to the start of the test program. This instrumentation provided data from three sources: pilot panel, copilot/engineer panel and a 50-channel oscillograph. All instrumentation was calibrated. The flight test instrumentation was installed and maintained by the Instrumentation Branch, Logistics Division, USAASTA. The following test parameters were presented.

Pilot Panel

(Boom system) airspeed
(Boom system) altitude
Rate of climb
Rotor speed
Gas producer speed
(Standard system) torque pressure
Longitudinal control position
Lateral control position
Pedal control position
Collective control position
Center of gravity normal acceleration
Angle of sideslip

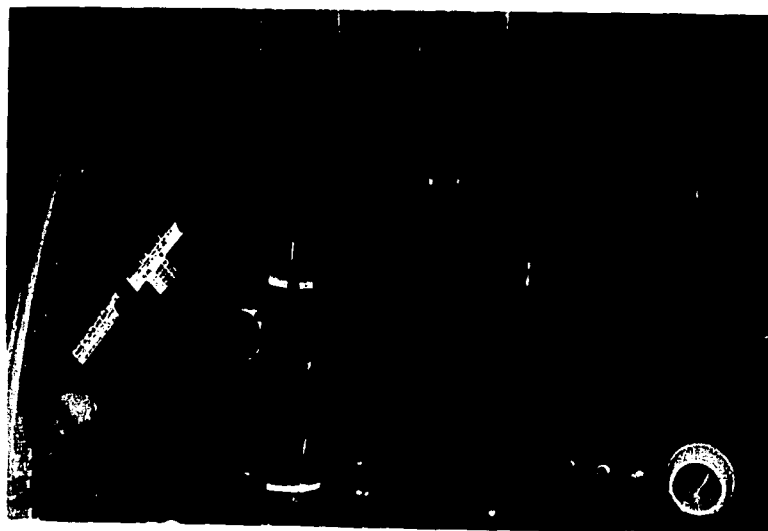


Photo 1. Pilot Panel for Aircraft S/N 6715695

Engineer Panel

(Boom system) airspeed
(Boom system) altitude
Outside air temperature
Rotor speed
Fuel used total
Oscillograph correlation counter

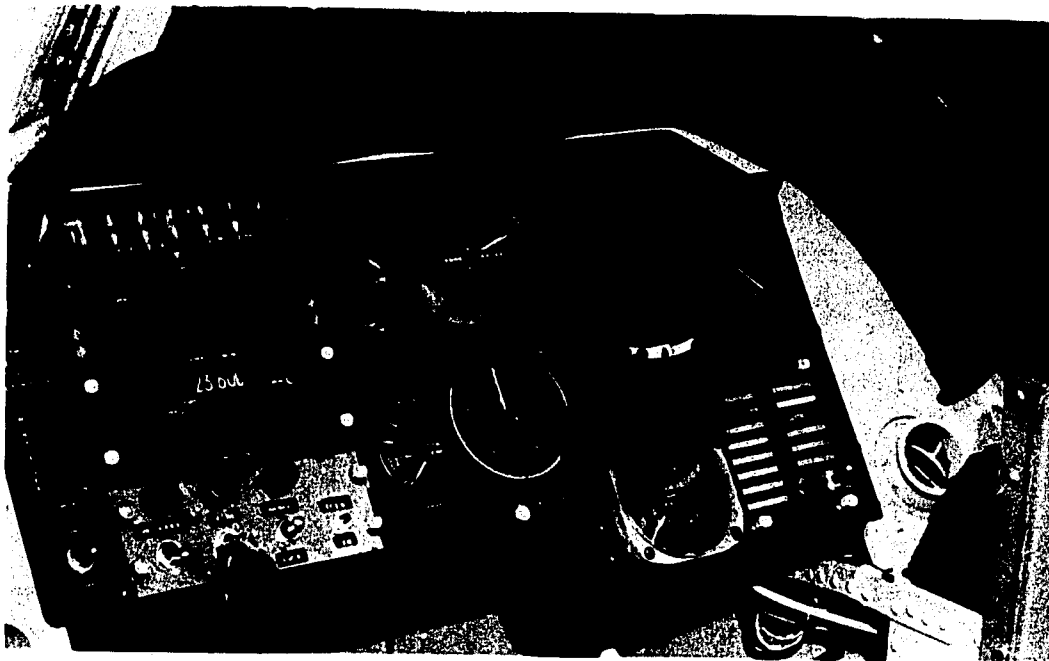


Photo 2. Engineer Panel for Aircraft S/N 6715695.

Oscillograph

Longitudinal control position
Lateral control position
Directional control position
Collective control position
Pitch attitude
Roll attitude
Yaw attitude
Pitch rate
Roll rate
Yaw rate
Angle of attack
Angle of sideslip
CG normal acceleration
Longitudinal SCAS position
Lateral SCAS position
Directional SCAS position
Rotor blip
Lateral and vertical vibration sensors (pilot seat)
Lateral and vertical vibration sensors (copilot/gunner seat)
Lateral and vertical vibration sensors (copilot/gunner site mounting)
Pilot event
Engineer event

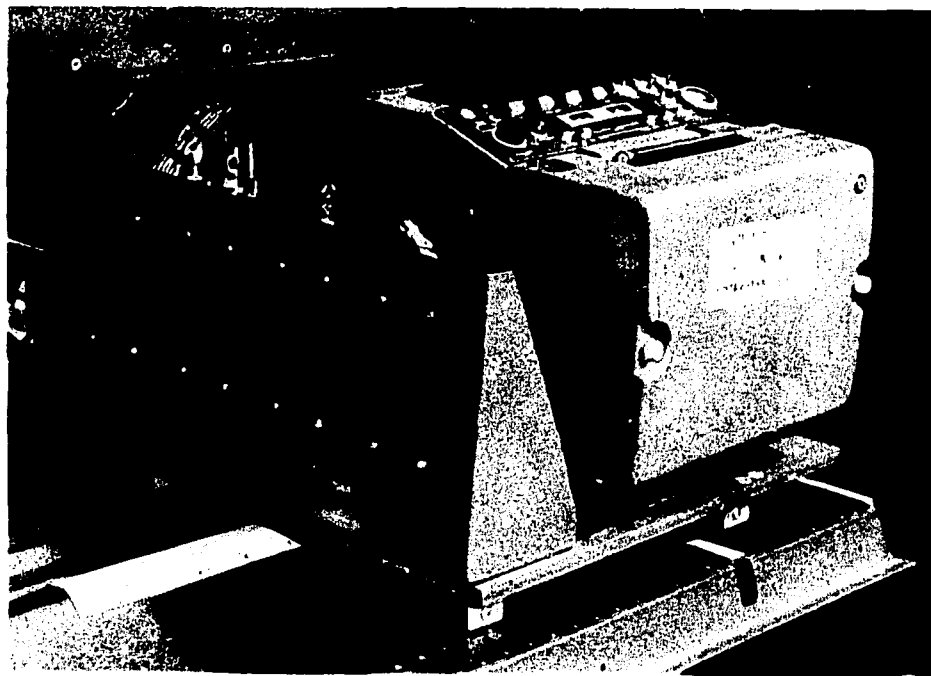


Photo 3. 50-Channel Oscillograph Installed in Aircraft S/N 6715695.

USA S/N 6615247

Flight test instrumentation was installed in the test helicopter prior to the start of this evaluation. This instrumentation provided data from four sources: pilot panel, copilot/engineer panel, photopanel and a 24-channel oscillograph. All instrumentation was calibrated. Some of the instrumentation was used for only a portion of the test program. The flight test instrumentation was installed and maintained by the Instrumentation Branch, Logistics Division, USAASTA. The following test parameters were presented:

Pilot Panel

(Standard system) airspeed
(Boom system) airspeed
(Boom system) altitude
Rate of climb
Gas producer speed
(Standard system) torque pressure
Exhaust gas temperature
Longitudinal control position
Lateral control position
Pedal control position
Collective control position
CG normal acceleration
Angle of sideslip

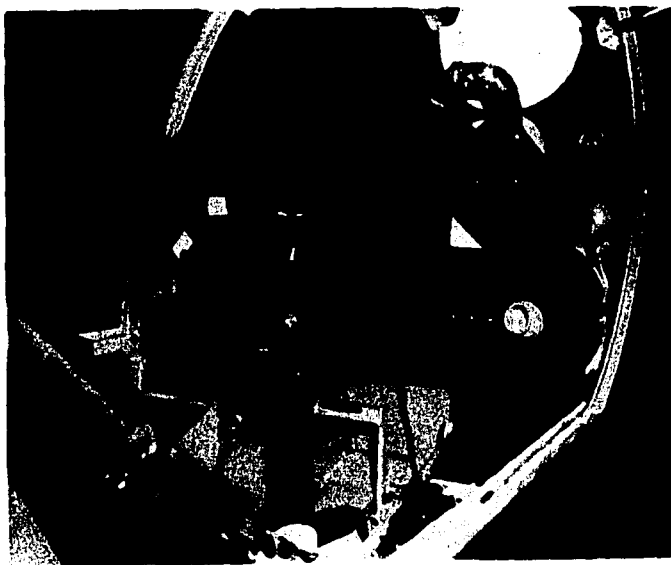


Photo 4. Pilot Panel for Aircraft S/N 6615247.

Engineer Panel

(Boom system) altitude
Outside air temperature
Rotor speed
Gas producer speed
Fuel used total
Torque pressure (high)
Torque pressure (low)
Exhaust gas temperature
Oscillograph correlation counter
Photopanel correlation counter
Fuel temperature
Engine fuel flow

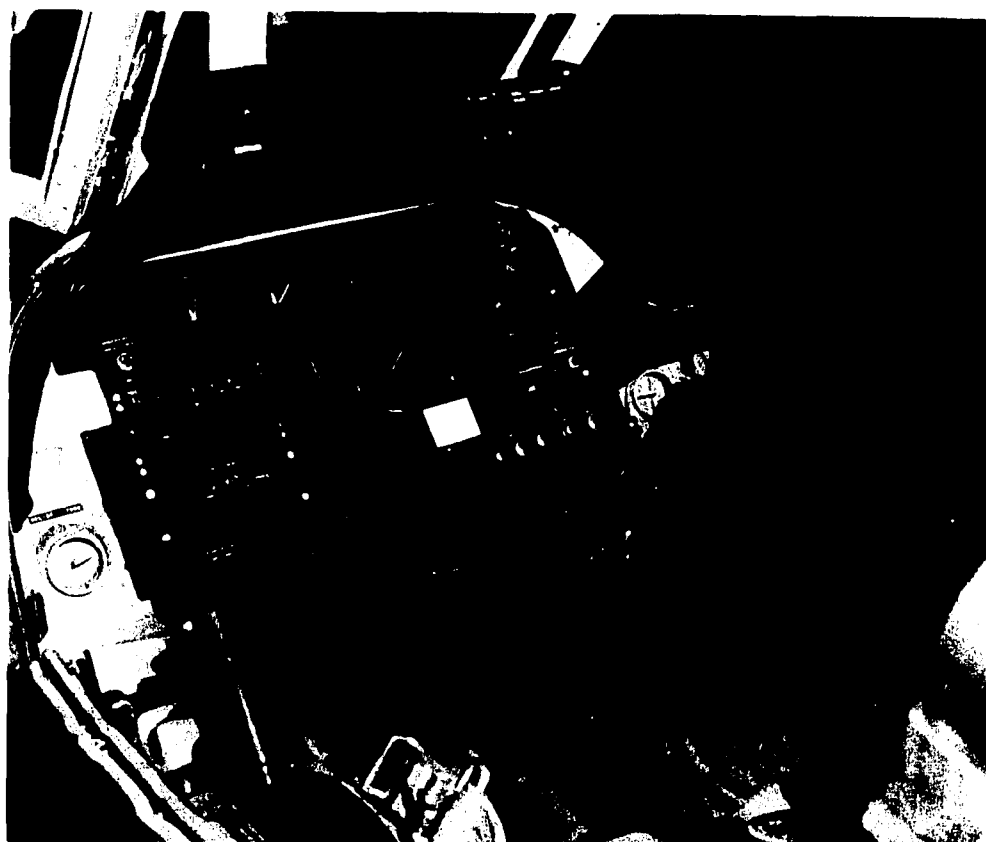


Photo 5. Engineer Panel for Aircraft S/N 6615247.

Photopanel

(Boom system) airspeed
(Standard system) airspeed
(Boom system) altitude
Rotor speed
Gas producer speed
Fuel used total
Torque pressure (high)
Torque pressure (low)
Exhaust gas temperature
Compressor inlet temperature
Compressor inlet total pressure
Inlet guide vane position
Bleed band position (light)
Fuel pressure at nozzle
Time (10-second stopwatch)
Oscillograph correlation counter
Photopanel correlation counter
Engineer event
Pilot event

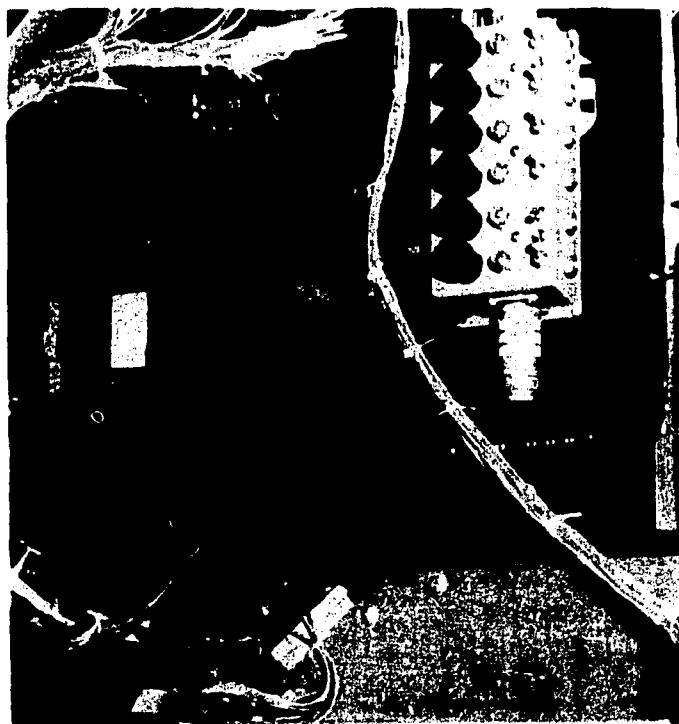


Photo 6. Photopanel Installed in Aircraft S/N 6615247.

Oscillograph

Longitudinal control position
Lateral control position
Directional control position
Collective control position
Pitch attitude
Roll attitude
Yaw attitude
Pitch rate
Roll rate
Yaw rate
CG normal acceleration
Angle of sideslip
Angle of attack
Tail rotor torque
Main rotor flapping angle
Linear rotor speed
Photopanel correlation flip
Engineer event
Pilot event

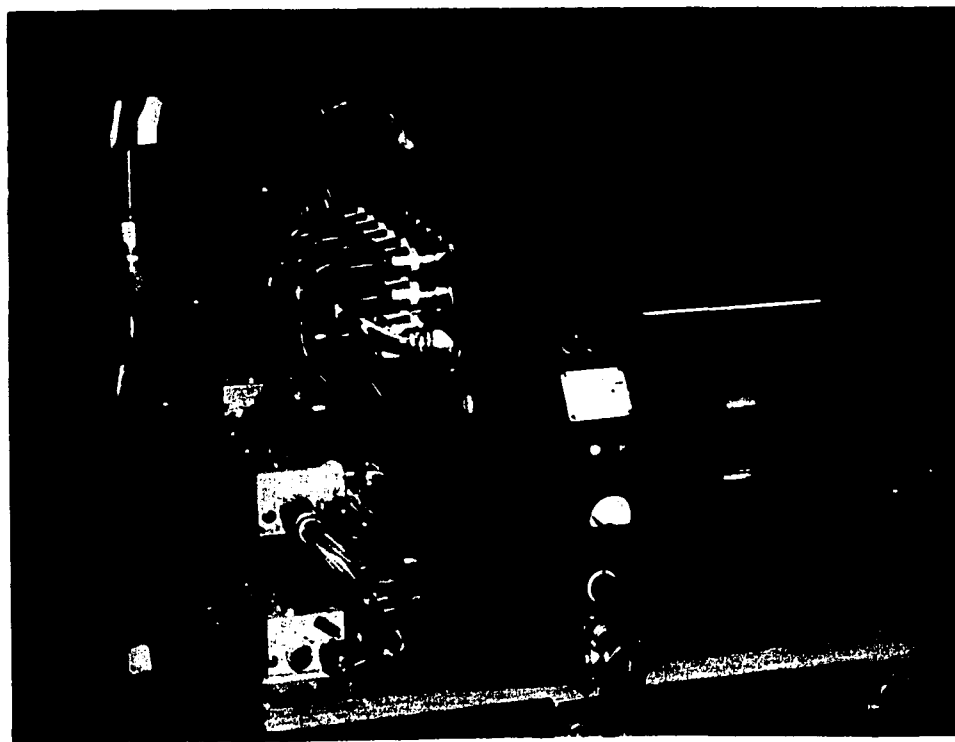


Photo 7. 24-Channel Oscillograph Installed in Aircraft S/N 6615247.

APPENDIX VI. APPROVED HANDLING QUALITIES DEVIATION FROM MIL-H-8501A

1. The model specification states that MIL-H-8501A shall be used as a design guide for the stability and control characteristics for the AH-1G aircraft, except for paragraph 3.6 "Instrument Flight Conditions".

2. The deviations from MIL-H-8501A are presented in the following statements:

Contractor Deviation Number	Model Specification Paragraph Number (ref 13, app I)	Subject
42	3.3.2.1	<u>Cyclic Breakout Force</u>

Requirement: Paragraphs 3.2.4, 3.2.7 and 3.3.11 specifies that the cyclic breakout force shall be not less than 0.5 pounds nor more than 1.5 pounds. Also, the breakout force shall not be greater than the force produced by the trim force gradient in the first inch of stick travel.

Deviation: The breakout force for the pilot cyclic shall be 2.0 \pm 0.25 pounds.

Reason: The design values of the aircraft cyclic breakout force are such that: (1) to prevent stability augmentation system feedback and (2) cyclic stick flop. The aircraft handling qualities test conducted by ATA pilots have shown that the aircraft performed in accordance with MIL-H-8501 as defined in BHC Specification 209-947-042, Handling Qualities Demonstration.

1	3.3.2.1	<u>Control Characteristics</u>
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Requirement: Specification MIL-H-8501 shall be used as a design guide for the stability and control characteristics for this aircraft, except for paragraph 3.6 (Instrument Flight Conditions).

Deviation: Those requirements of MIL-H-8501, paragraph 3.3 pertaining to control continuity shall not be applicable.

Reason: Aerodynamic discontinuities due to airflow pattern affect tail rotor thrust during some phases of sideward and rearward flight. Increased tail rotor rigging to compensate for the disturbance results in over torque of the tail rotor drive system.

APPENDIX VII. TEST DATA

FIGURE No. 1
LONGITUDINAL CYCLIC CONTROL FORCES
AH-1G USAF 15898

- NOTES: 1. RECORD STATIC AND CYCLIC FRICTION AT A
PERMIT TANK IN ACCORDANCE WITH REF. 12 APR 7
2. HYDRAULIC AND ELECTRICAL POWER PROVIDED
BY GROUND POWER UNITS
3. NO. 1 & NO. 2 BOOST SYSTEMS ON.
4. SOLID SYMBOL DENOTES TRIM POINT
5. 0 DENOTES COLLECTIVE + 4.64 INCHES
FROM FULL DOWN
6. 0 DENOTES COLLECTIVE + 8.41 INCHES
FROM FULL DOWN

8. CONTROL POSITIONS
LATERAL = 5.81 INCHES FROM FULL LEFT
DIRECTIONAL = 2.99 INCHES FROM FULL LEFT
9. TOTAL CONTROL DISPLACEMENTS
LONGITUDINAL = 10.83 INCHES FROM FULL FORWARD
LATERAL = 9.90 INCHES FROM FULL LEFT
DIRECTIONAL = 5.97 INCHES FROM FULL LEFT
COLLECTIVE = 8.90 INCHES FROM FULL DOWN
10. FORCES MEASURED AT CENTER OF GRIP

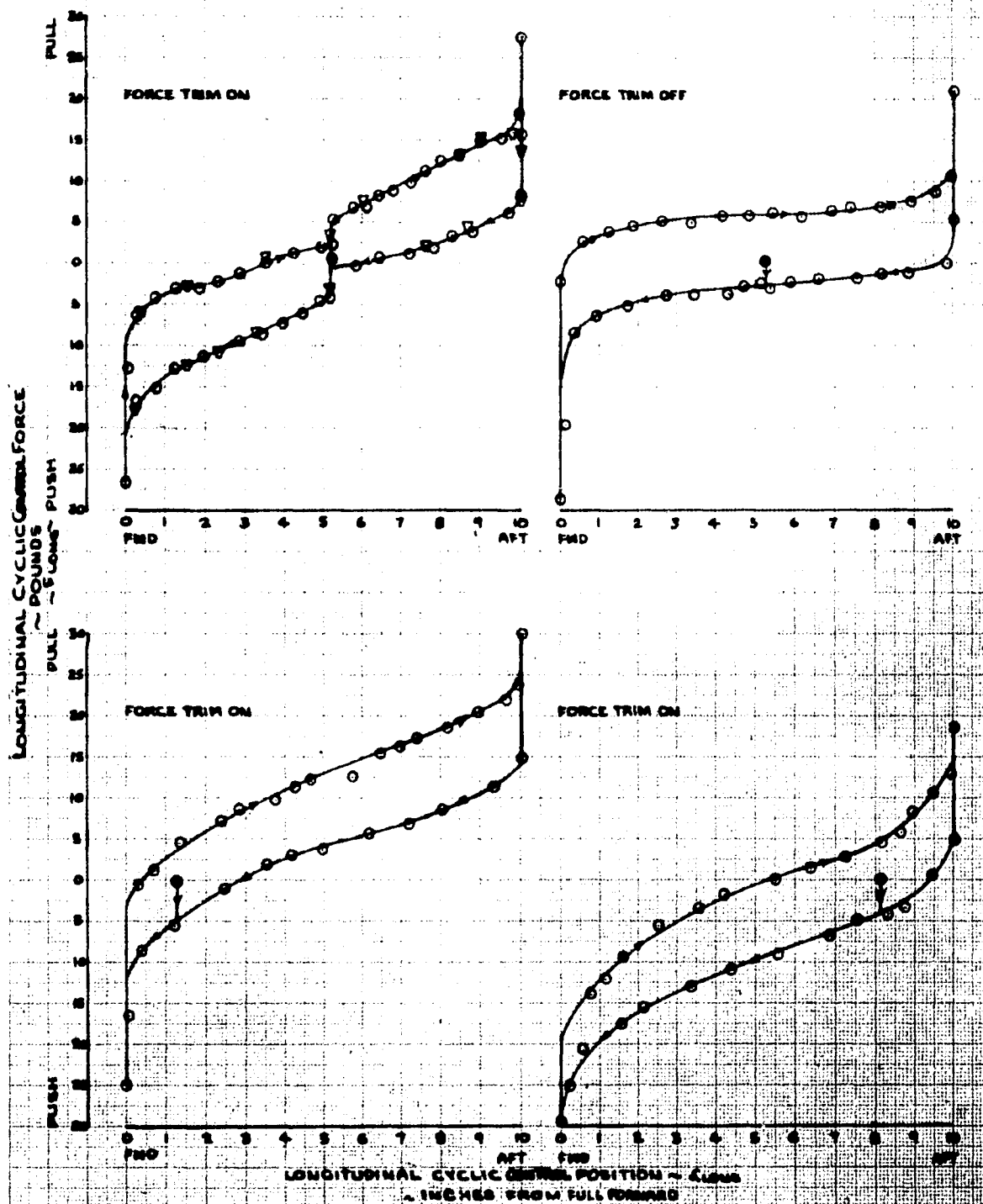


FIGURE NO. 2
LATERAL CYCLIC CONTROL FORCES
AH-1G USAF/USMC

NOTES: 1. ROTOR STATIC AND CYCLIC FRICTION AT A
PRESET LEVEL IN ACCORDANCE WITH REF 12 APR 71
3. HYDRAULIC AND ELECTRICAL POWER PROVIDED
BY GROUND POWER UNITS
4. NO. 1 & NO. 2 BOOST SYSTEMS ON
5. SOLID SYMBOLS DENOTE TRIM POINT
6. O DENOTES COLLECTIVE + 4.6 INCHES
FROM FULL DOWN
7. ▽ DENOTES COLLECTIVE + 2.50 INCHES
FROM FULL DOWN

8. CONTROL POSITIONS:
LONGITUDINAL - 4.64 INCHES FROM FULL FWD.
DIRECTIONAL - 2.49 INCHES FROM FULL LEFT
9. TOTAL CONTROL DISPLACEMENTS:
LONGITUDINAL - 10.08 INCHES FROM FULL FWD.
LATERAL - 9.90 INCHES FROM FULL LEFT
DIRECTIONAL - 5.97 INCHES FROM FULL LEFT
COLLECTIVE - 8.48 INCHES FROM FULL DOWN
2. FORCES MEASURED AT CENTER OF GRIP

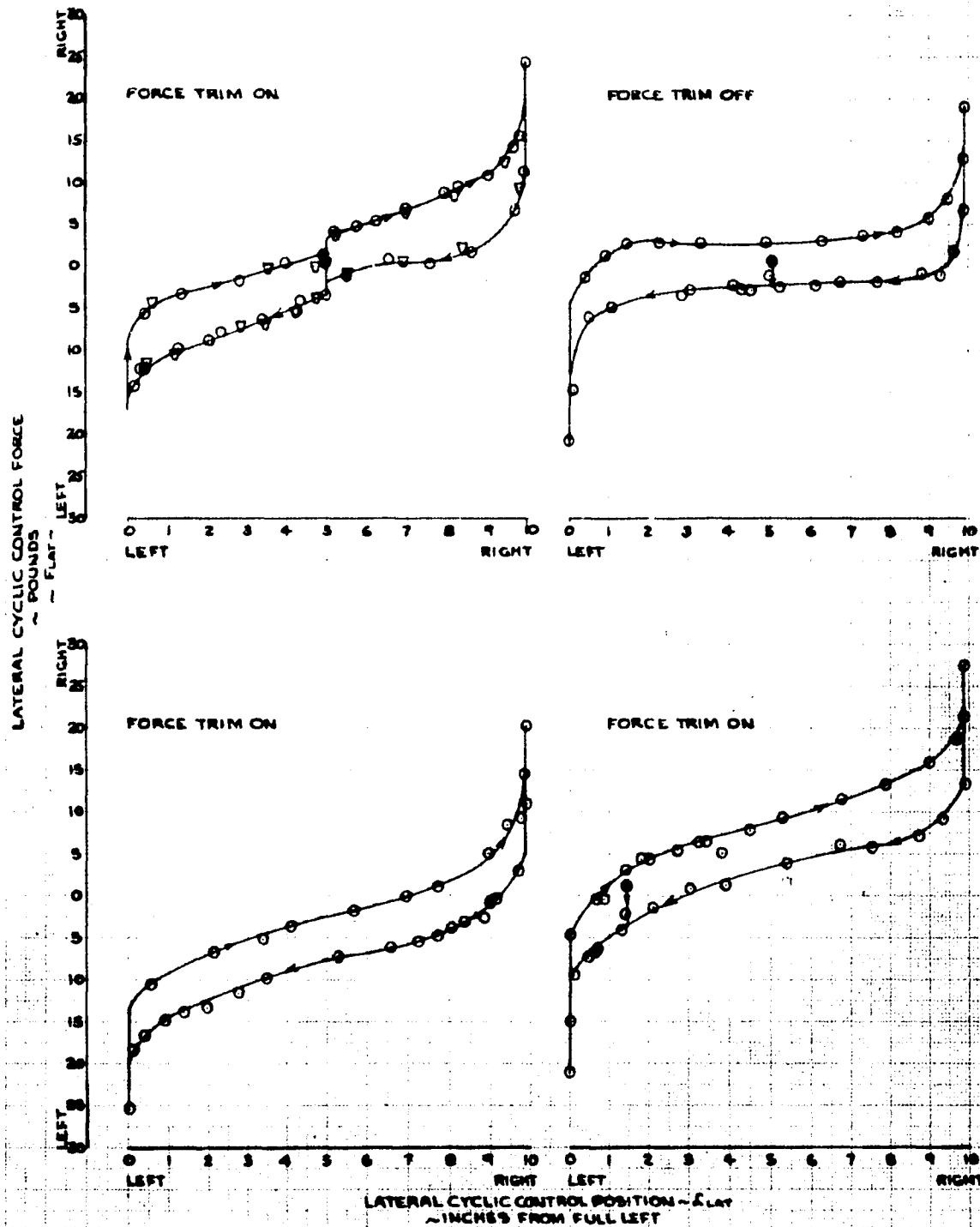


FIGURE NO. 3
DIRECTIONAL CONTROL FORCES
 AH-1G USAF 715695

NOTES: 1. ROTOR STATIC AND CYCLIC FRICTION MAY A
 PRE SET LEVEL IN ACCORDANCE WITH REF. 12 APP. 3
 2. HYDRAULIC AND ELECTRICAL POWER PROVIDED
 BY GROUND POWER UNITS
 4. SOLID SYMBOLS DENOTE TRIM POINT
 5. 0 DENOTES COLLECTIVE + 4.6 INCHES
 FROM FULL DOWN
 6. 7 DENOTES COLLECTIVE + 8.50 INCHES
 FROM FULL DOWN

7. CONTROL POSITIONS:
 LONGITUDINAL + 4.6 IN. FROM FULL FWD.
 LATERAL + 5.31 IN. FROM FULL LEFT
 8. TOTAL CONTROL DISPLACEMENTS:
 LONGITUDINAL + 10.03 IN. FROM FULL FWD.
 LATERAL + 9.90 IN. FROM FULL LEFT
 DIRECTIONAL + 5.97 IN. FROM FULL LEFT
 COLLECTIVE + 8.98 IN. FROM FULL DOWN
 9. FORCES MEASURED AT THE TOP OF THE PEDAL

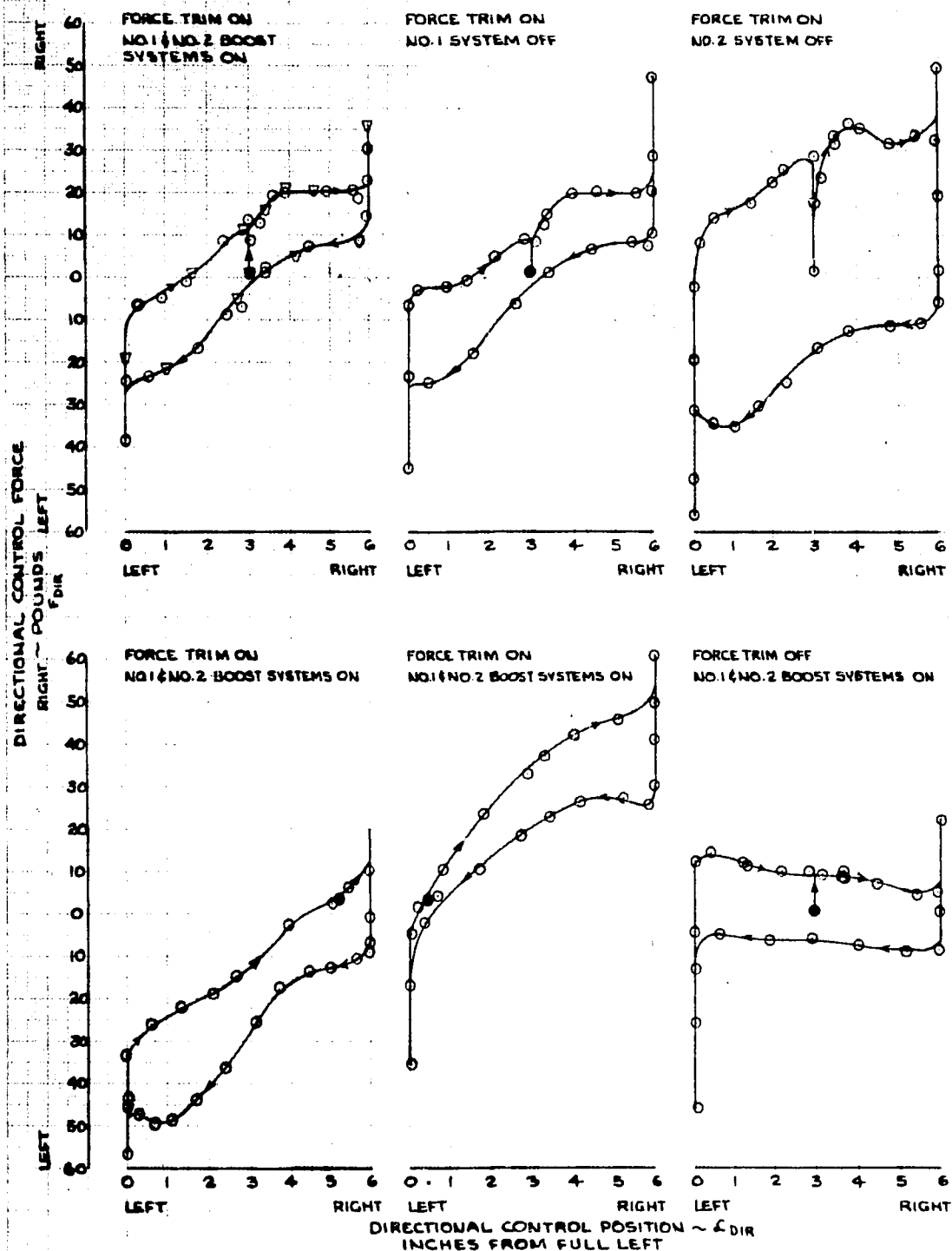


FIGURE No. 4
CYCLIC PITCH CONTROL PATTERN
AH-1G USAF T15695

- NOTES:**
1. ROTOR STATIC
 2. HYDRAULIC AND ELECTRICAL POWER PROVIDED BY GROUND POWER UNITS
 3. NO. 1 & NO. 2 BOOST SYSTEMS ON
 4. O DENOTES COLLECTIVE • 9.64 INCHES FROM FULL DOWN
 5. ▽ DENOTES COLLECTIVE • 8.50 INCHES FROM FULL DOWN
 6. CONTROL POSITION
 DIRECTIONAL • 2.96 INCHES FROM FULL LEFT
 7. TOTAL CONTROL DISPLACEMENTS:
 LONGITUDINAL • 10.03 INCHES FROM FULL FORWARD
 LATERAL • 9.90 INCHES FROM FULL LEFT
 DIRECTIONAL • 5.97 INCHES FROM FULL LEFT
 COLLECTIVE • 9.98 INCHES FROM FULL DOWN

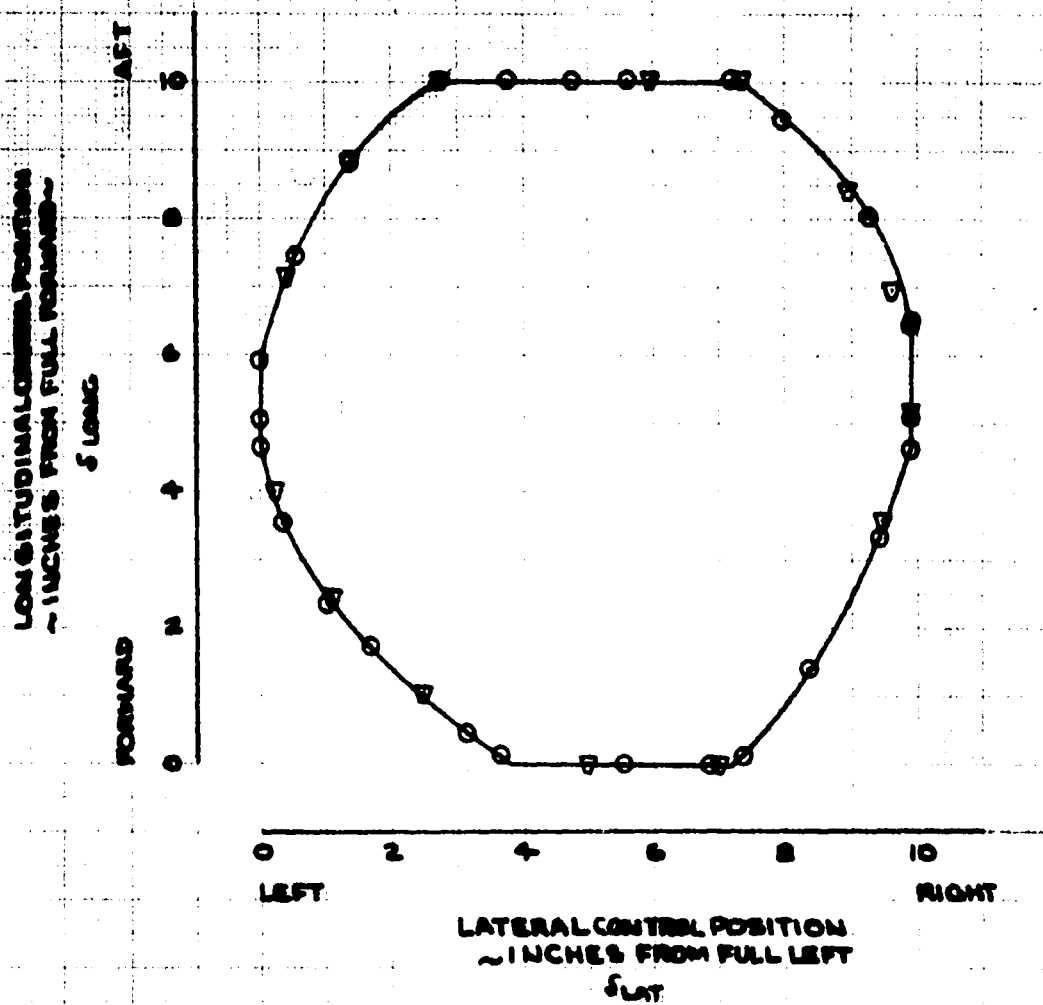


FIGURE No. 5
SUMMARY OF CONTROL POSITIONS IN FORWARD FLIGHT
AN-1G USAF T15695

SYM.	AVE. ALT. H ₀ -FT.	AVE. GENT. ~LB	AVE. LONG. C.G.-IN.	ROTOR RPM	CONFIG.	FLY. COND.	THRUST COEFF. ~C _T
○	8360	8530	200.8(AFT)	323.5	HVY. HOG	LEVEL FLY/DIVE	0.004885
△	4540	8460	200.8(AFT)	324.0	CLEAN		0.004807
□	4440	9580	200.0(AFT)	326.0	HVY. HOG		0.005394
◇	4960	8620	191.8(FWD)	324.0	HVY. HOG		0.004961
○	4980	8470	191.4(FWD)	324.0	CLEAN		0.004878
△	3720	8800	200.8(AFT)	324.0	OUT'D ALT.		0.004712
□	4040	8870	201.0(AFT)	324.5	HVY. SCOUT		0.004671
◇	3600	9555	200.0(AFT)	324.5	HVY. SCOUT		0.005246
▽	4480	9480	200.0(AFT)	325.0	OUT'D ALT.		0.005650
○	14100	8420	200.9(AFT)	323.0	CLEAN	LEVEL FLY	0.006998
▽	14760	8600	200.7(AFT)	323.0	HVY. HOG		0.006775
○	15800	8410	200.7(AFT)	324.0	OUT'D ALT.		0.006885

NOTES: 1. POINTS DERIVED FROM FIGURES 8 THROUGH 20 APPENDIX VII
2. POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLE REQUIREMENT WITH INCREASING AIRSPEED

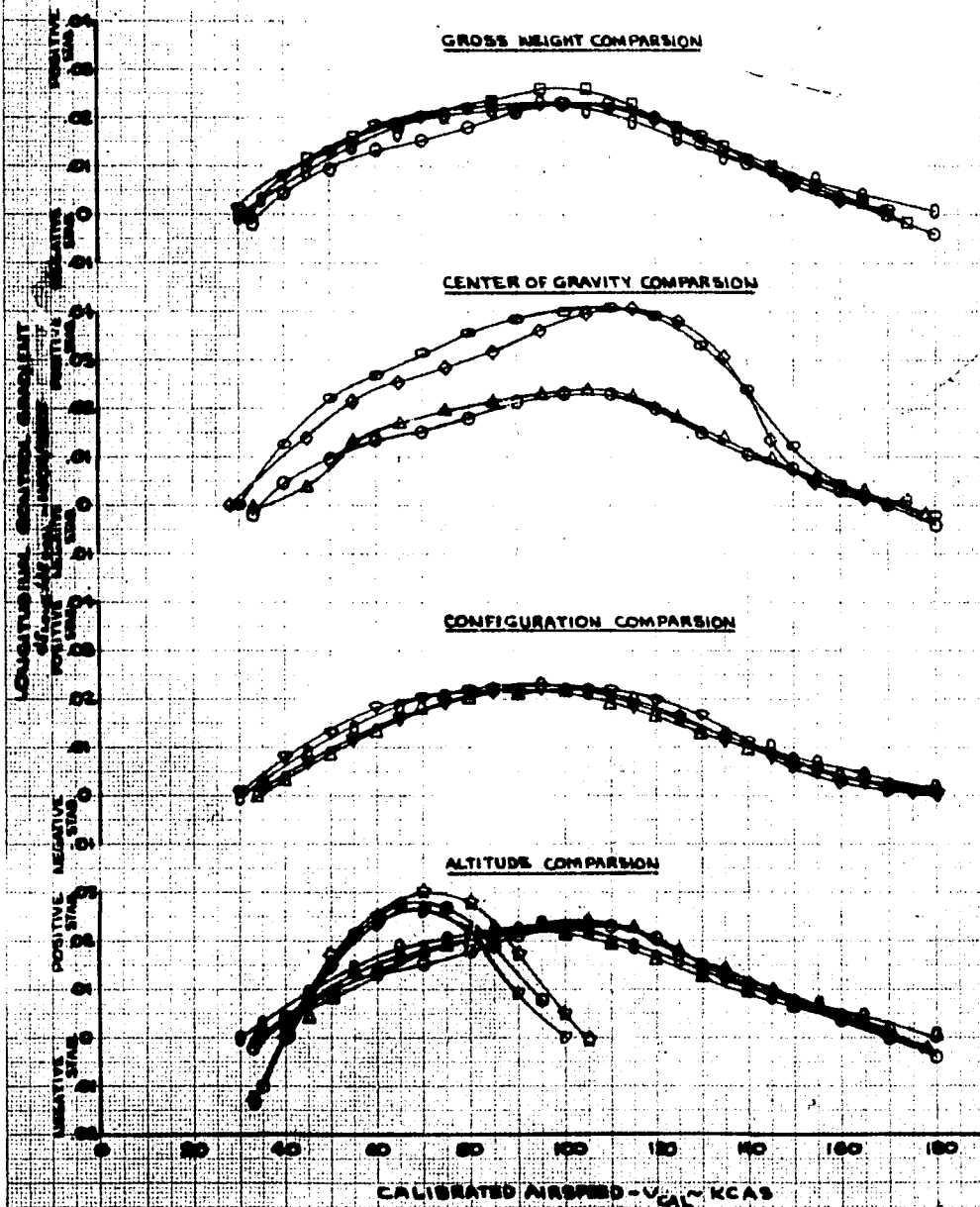


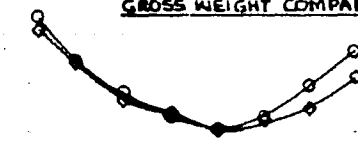
FIGURE No. 6
SUMMARY OF CONTROL POSITIONS IN CLIMB & AUTOROTATION
AH-1G USAF 15695

SYM.	AVG. ALT. H ₀ -FT.	ANG. GENT. ~ LB.	ANG. LONG. C.G.-IN.	ROTOR RPM	CONFIS. FLT. COND.	THRUST COEFF. ~ C _T
○	5470	9320	200.2 (AFT)	324.0	↓	CLIMB 0.005448
▽	4950	9290	200.1 (AFT)	331.0	↓	AUTO. 0.005121
◇	6000	9280	201.0 (AFT)	324.0	↓	CLIMB 0.004919
△	6920	9310	201.0 (AFT)	320.0	↓	AUTO. 0.005048
○	5660	9360	191.5 (FWD)	324.0	↓	CLIMB 0.004608
△	5770	9340	191.5 (FWD)	324.0	↓	AUTO. 0.004920
△	5470	9170	201.1 (AFT)	323.5	CLEAN	CLIMB 0.004790
○	4950	9170	201.1 (AFT)	317.0	↓	AUTO. 0.004910
□	6000	9240	191.2 (FWD)	323.0	↓	CLIMB 0.004778
◇	5000	9290	191.2 (FWD)	324.0	↓	AUTO. 0.004777

NOTES: 1. POINTS DERIVED FROM FIGURES 21 THROUGH 26, APPENDIX III.
2. POSITIVE LONGITUDINAL STABILITY SIGNIFIES AN INCREASING FORWARD CYCLIC REQUIREMENT WITH INCREASING AIRSPEED.

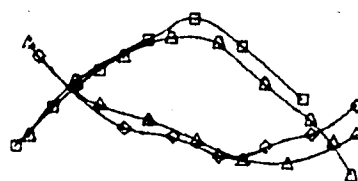
GROSS WEIGHT COMPARISON IN CLIMBING FLIGHT

LONGITUDINAL CONTROL GRADIENT
 $dC_{LONG}/dV_{CAL} \sim \text{INCH/KNOT}$
POSITIVE STAB. POSITIVE STAB. NEGATIVE STAB.



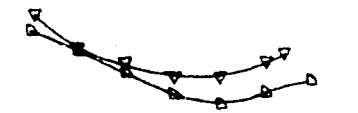
CENTER OF GRAVITY & CONFIGURATION COMPARISON IN CLIMBING FLIGHT

LONGITUDINAL CONTROL GRADIENT
 $dC_{LONG}/dV_{CAL} \sim \text{INCH/KNOT}$
POSITIVE STAB. POSITIVE STAB. NEGATIVE STAB.



GROSS WEIGHT COMPARISON IN AUTOROTATIVE FLIGHT

POSITIVE STAB. POSITIVE STAB. NEGATIVE STAB.



CENTER OF GRAVITY & CONFIGURATION COMPARISON IN AUTOROTATIVE FLIGHT

POSITIVE STAB. POSITIVE STAB. NEGATIVE STAB.



CALIBRATED AIRSPEED - V_{CAL} - KCAS

Figure No. 7
Summary of Control Positions in Forward Flight

AH-1G

SYM	AIRCRAFT	AVG G.A.L. AVE. LONG	ROTOR	CONFIG.	FLI COND.	THRUST COEFF.	AIRCRAFT
	H ₂ -ST.	~1.5	C.G. ~10. RPM			C _T	TAJ
A	25-40	2000 (AF)	224	CLEAN	LEVEL RE/ONE	0.000000	TIG 678
O	2000	1400 (AF)	223	CLEAN (THIS DATA LEVITATION/ONE 0.000000)			215 943

NOTE: OPEN SYMBOLS DENOTE LEVEL FLIGHT
CROSSED SYMBOLS DENOTE DIVE

2. POINTS DERIVED FROM FIGURES 10 THROUGH 27, APPENDIX III
3. POSITIVE LONGITUDINAL CYCLIC STABILITY SIGNIFIES AN
INCREASING FORWARD CYCLIC REQUIREMENT WITH
INCREASING AIRSPEED

LONGITUDINAL CONTROL GRAPH
d_{long}/d_{long} - INCH/INCH
NEGATIVE d_{long}/d_{long} - POSITIVE d_{long}/d_{long}

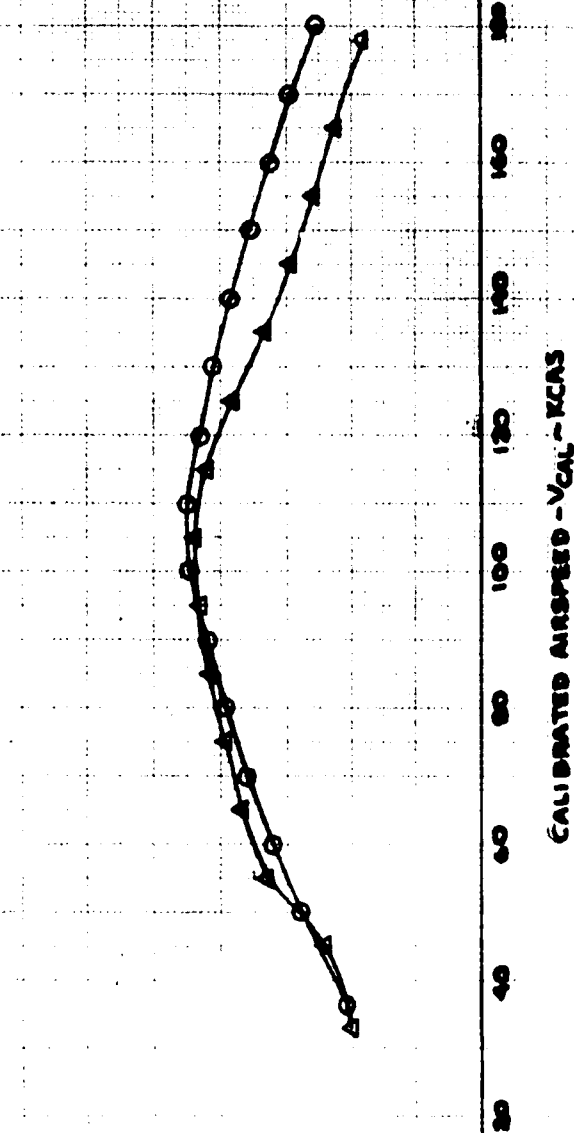


FIGURE NO. 8
 STATIC TRIM STABILITY
 AH-1G USARV 15698
 CLEAN CONFIGURATION

SYM	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C _T	FLT. COND.
0	4460	7860	190.3 (FWO)	323.5	0.004183	LEVEL FLT.
17	5220	7210	190.2 (FWO)	321.0	0.004261	DIVE

NOTES: 1. KM-28 CHIN TURBINE INSTALLED (STOWED POSITION)

2. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL: 10.00 INCHES FROM FULL FORWARD

LATERAL: 4.90 INCHES FROM FULL LEFT

DIRECTIONAL: 8.97 INCHES FROM FULL LEFT

COLLECTIVE: 8.98 INCHES FROM FULL DOWN

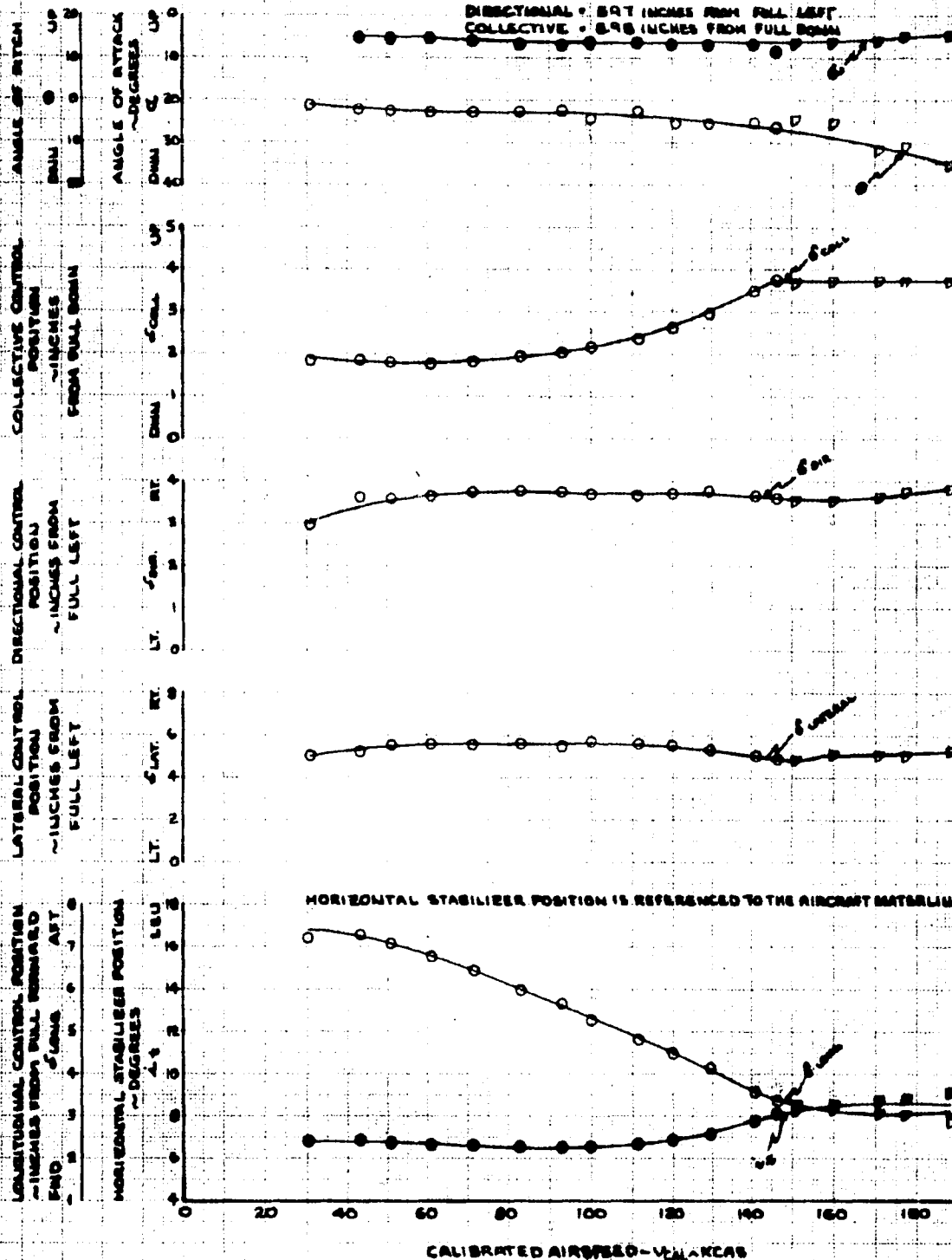


FIGURE No. 9
STATIC TRIM STABILITY
 AH-1G USA 64715695
 CLEAN CONFIGURATION

SYM	AVG ALT ~ FT	AVG GND ~ LB	AVG LONG C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C _T	FLT. COND.
90	4480 5440	8470 8240	181.4 (FMS) 181.2 (FMS)	324 324	0.004878 0.004812	LEVEL FLT. DIVE

NOTES: 1. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)

2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 100 IN. FROM FULL FORWARDED

LATERAL - 9.9 IN. FROM FULL LEFT

DIRECTIONAL - 5.97 IN. FROM FULL LEFT

COLLECTIVE - 8.98 INCHES FROM FULL DOWN

ANGLE OF PITCH
~ DEGREES
DOWN 0 5 UP 8

ANGLE OF ATTACK
~ DEGREES
DOWN 0 5 UP 8

COLLECTIVE CONTROL
POSITION
~ INCHES FROM
FULL DOWN

DOWN 0 5 UP 8

DIRECTIONAL CONTROL
POSITION
~ INCHES FROM FULL
LEFT

LY 0 5 RT 8

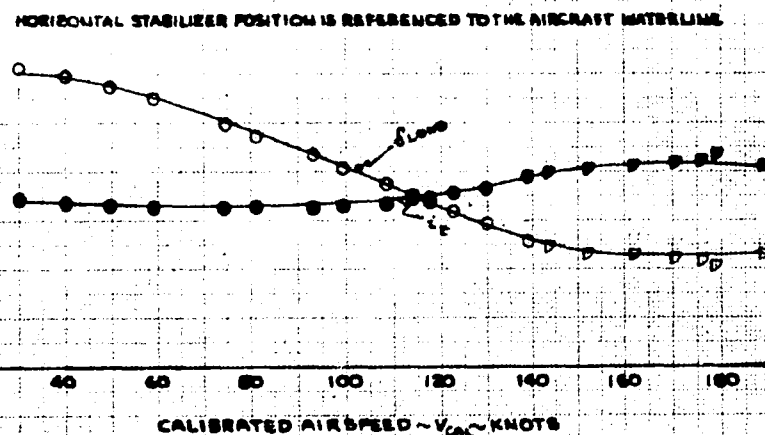
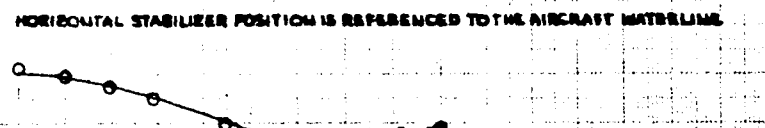
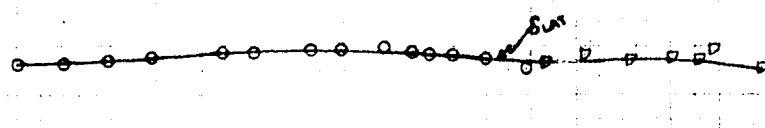
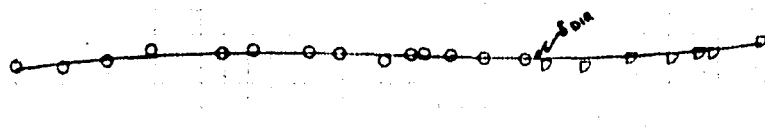
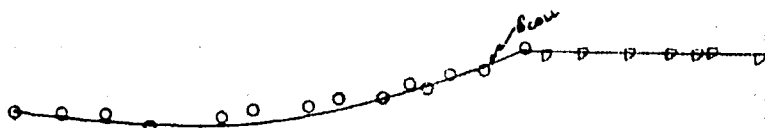
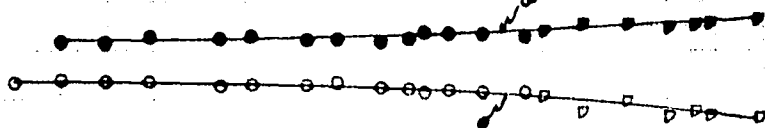
LATERAL CONTROL
POSITION
~ INCHES FROM
FULL LEFT

LY 0 5 RT 8

LONGITUDINAL CONTROL POSITION
~ INCHES FROM FULL FORWARDED

FWD 0 5 AFT 8

HORIZONTAL STABILIZER POS.
~ DEGREES
DOWN 0 5 UP 8



CALIBRATED AIRSPEED ~ V_{CA} ~ KNOTS

FIGURE No. 10
 STATIC TRIM STABILITY
 A-16 USAF 15673
 CLEAN CONFIGURATION

SYM	AVG. ALT. ~FT.	AVG. GM. ~LB.	AVG. WING C.G. ~IN.	NOTES RPM	THRUST CRST. ~ CF	FLY COND.
0	4540	8460	800.8 (AST)	824	0.004807	LEVEL FLY.
D	4520	8320	801.0 (AST)	824	0.004125	80% SWS

NOTES: 1. 541-28 CANNISTER INSTALL (FIXED POSITION)

2. TRIM CONTROL DISPLACEMENT

LONGITUDINAL - 10.00 INCHES FROM FULL FORWARD

LATERAL - 0.00 INCHES FROM FULL LEFT

DIRECTIONAL - 0.00 INCHES FROM FULL LEFT

COLLECTIVE - 0.00 INCHES FROM FULL DOWN

ANGLE OF PITCH
 ~ DEGREES
 DOWN UP

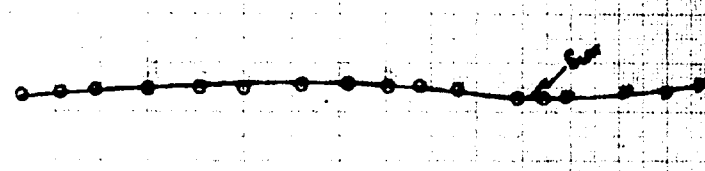
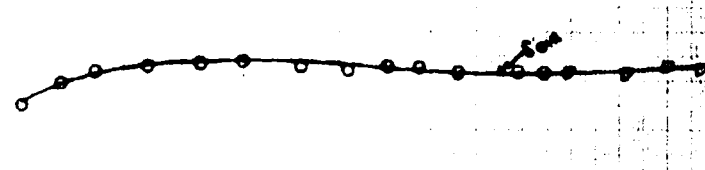
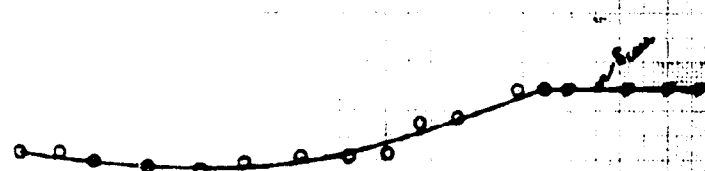
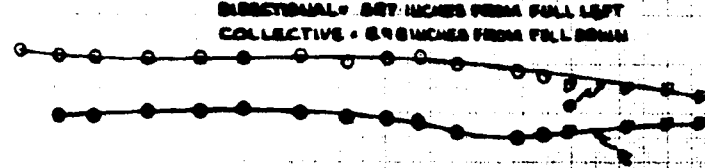
ANGLE OF ATTACK
 ~ DEGREES
 DOWN UP

COLLECTIVE CONTROL
 POSITION
 ~ INCHES
 FROM FULL DOWN
 DOWN UP

DIRECTIONAL CONTROL
 POSITION
 ~ INCHES FROM
 FULL LEFT
 LT. DIR. RT.

LATERAL CONTROL
 POSITION
 ~ INCHES FROM
 FULL LEFT
 LT. DIR. RT.

LONGITUDINAL CONTROL POSITION
 ~ INCHES FROM FULL FORWARD
 DOWN UP
 FORWARD AFT



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT CENTERLINE

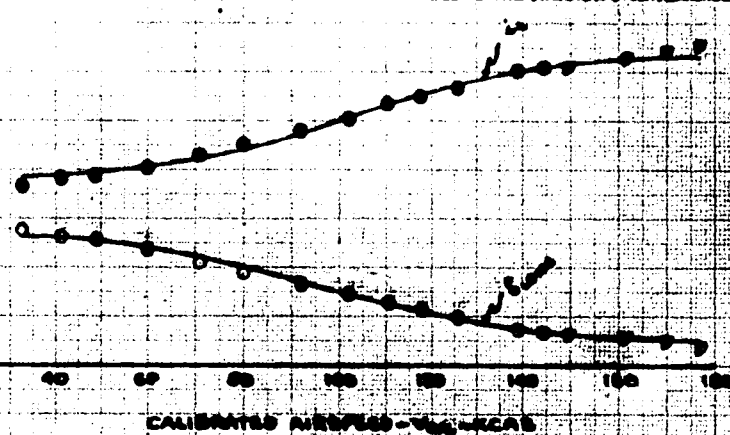


FIGURE No. 11
STATIC TRIM STABILITY
 AH-16 USAF 718485
 CLEAN CONFIGURATION

SEA	ANG ALT. MO-FT	AVG G.M. ~LB.	AVG LONG. C.G. ~IN.	ROTOR THRUST COEFF. RPM ~CT	FLT. COND.
0	16100	8420	2004 (AVT)	525.0 0.006448	LEVEL FLT.

NOTES: 1. 15A-28 CHIN RUBBER INSTALLED (STOWED POSITION)
 2. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
 LATERAL = 9.40 INCHES FROM FULL LEFT
 DIRECTIONAL = 8.97 INCHES FROM FULL LEFT
 COLLECTIVE = 8.98 INCHES FROM FULL DOWN

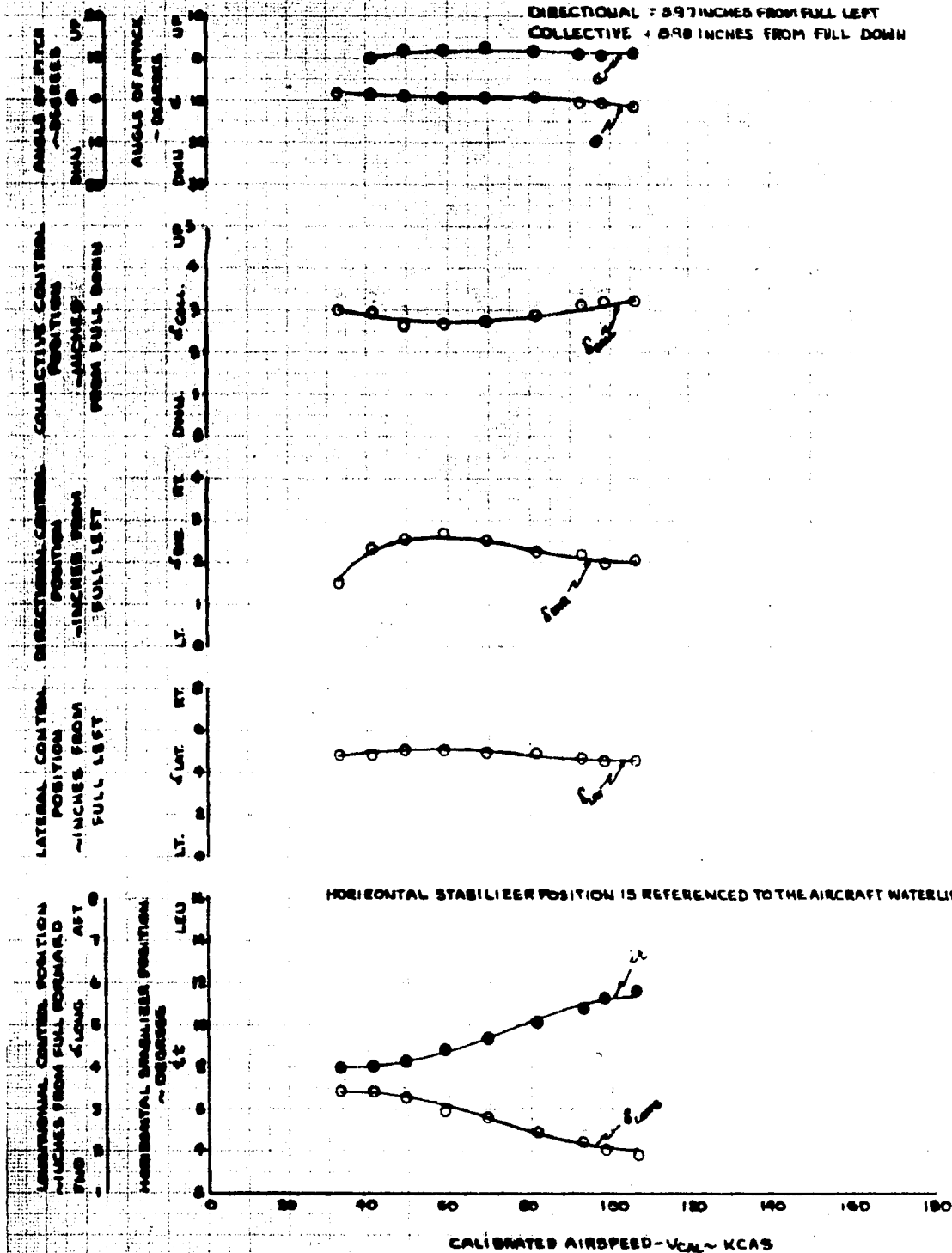


FIGURE No. 12
 STATIC TRIM STABILITY
 AM-10 LEAS/718408

OUT OF ALTERNATE CONFIGURATION WITH ROCKET PORT FAIRINGS REMOVED

SYM	AIR ALT H ₀ -FT	AVG. CM ~ LB.	AVG. LENS CS ~ IN.	ROTOR RPM	THRUST COEFF ~ CT	FLIGHT COND.
0	8750	8500	200.7 (AFT)	3240	0.006712	LEVEL FLT
7	4060	8760	200.9 (AFT)	3233	0.006697	DIVE

NOTES: 1. AM-10 CHUTTERST INSTALLED (STANDARD POSITION)

2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 18.05 INCHES FROM FULL FORWARD

LATERAL - 2.90 INCHES FROM FULL LEFT

DIRECTIONAL - 8.97 INCHES FROM FULL LEFT

COLLECTIVE - 8.98 INCHES FROM FULL DOWN

ANGLE OF PITCH
 ~ DEGREES
 DOWN UP

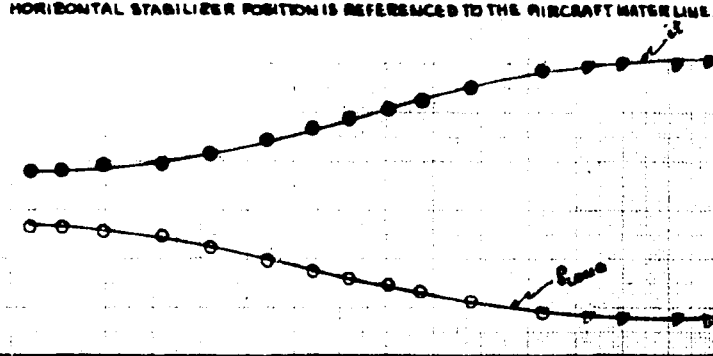
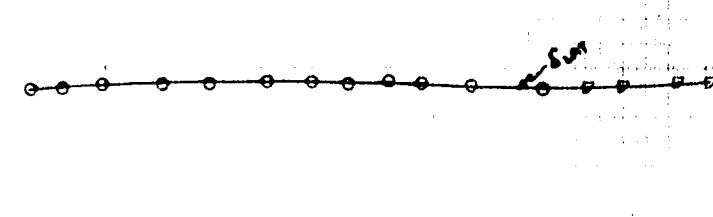
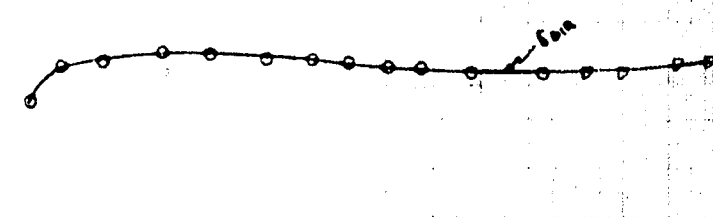
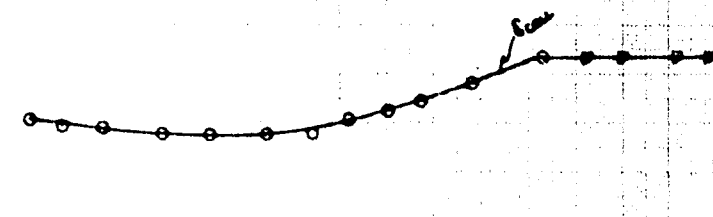
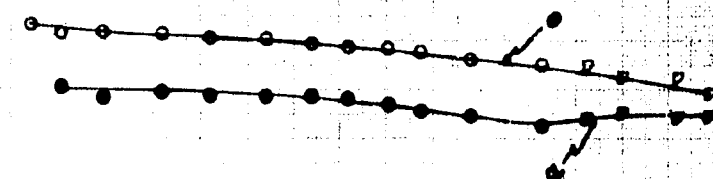
COLLECTIVE CONTROL
 POSITION
 ~ INCHES
 FROM FULL DOWN

DIRECTIONAL CONTROL
 POSITION
 ~ INCHES FROM
 FULL LEFT

LATERAL CONTROL
 POSITION
 ~ INCHES FROM
 FULL LEFT

LONGITUDINAL CONTROL POSITION
 ~ INCHES FROM FULL FORWARD
 END

HORIZONTAL STABILIZER POSITION
 ~ DEGREES
 LEU



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE.

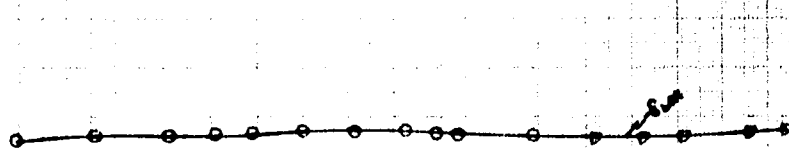
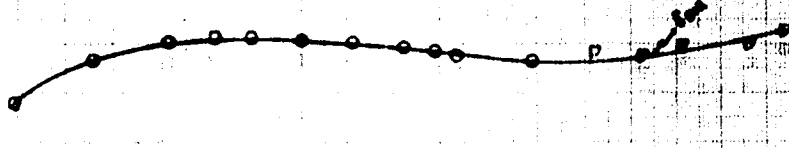
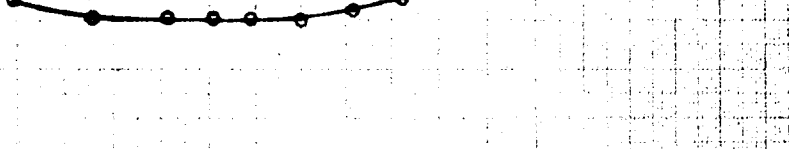
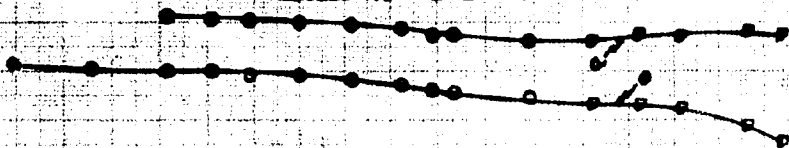
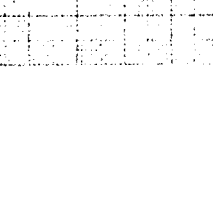
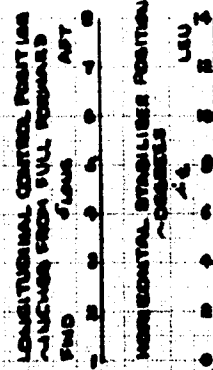
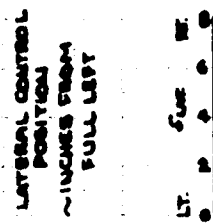
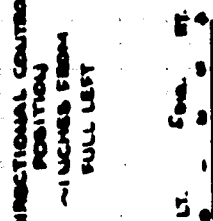
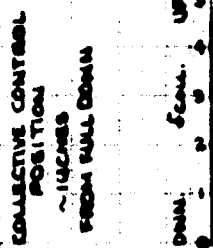
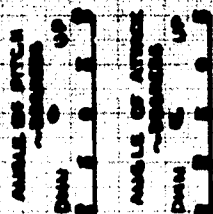
CALIBRATED AIRSPEED - V_{cal} - KCAS

Figure No. 15 Horizontal Stabilizer Full Deflection

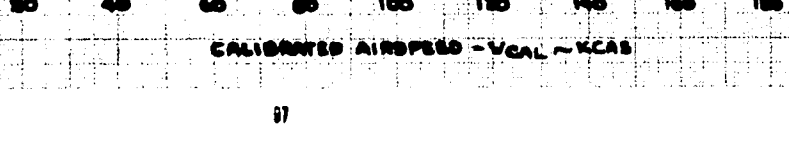
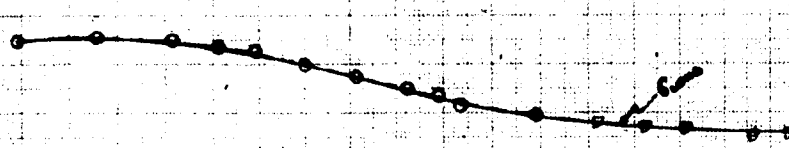
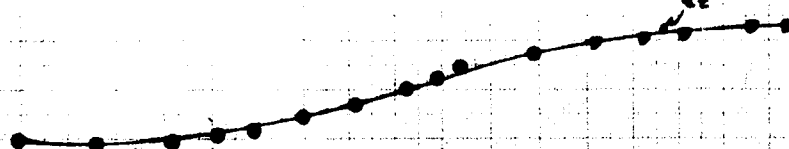
DATA, AIRSPEED, CORRECTED FOR WEIGHT FOR WEIGHTS REMOVED

WING	WING	WING	WING	WING	WING	WING
1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000
1000	1000	1000	1000	1000	1000	1000

GENERAL LER-35 DOWN THRUST INSTALLED (DOWNED POSITION)
B. HORIZONTAL DISPLACEMENT
LONGITUDINAL - INCHES FROM FULL FORWARD
LATERAL - INCHES FROM FULL LEFT
DIRECTIONAL - INCHES FROM FULL LEFT
COLLECTIVE - INCHES FROM FULL DOWN



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATER LINE

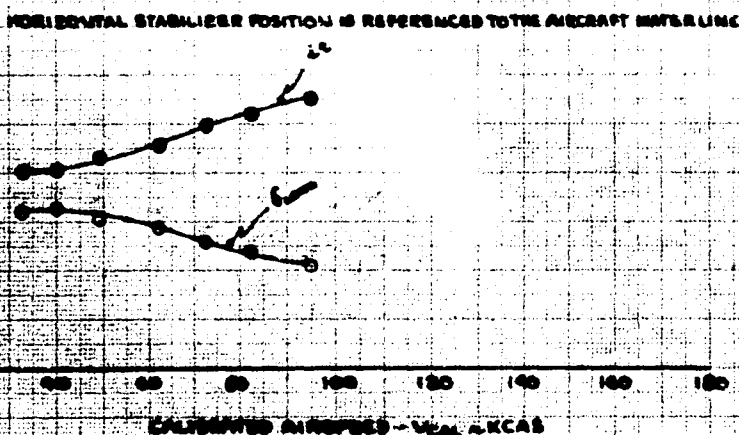
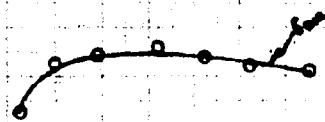
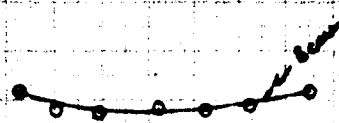


CALIBRATED AIRSPEED - V_{CL} ~ KCAS

OUT OF ATLANTA'S CONSCIENTIOUS WITH THE FOUR STARRED PRISONERS

NOTES: 1. LONG CENTER MOUNT MASTERS (HARDY SECTION)
2. TOTAL CENTER DISPLACEMENT

LONGITUDINAL	: 12 INCHES FROM FULL FORWARD
LATERAL	: 7 INCHES FROM FULL LEFT
DIRECTIONAL	: 8 INCHES FROM FULL LEFT
COLLECTIVE	: 6 INCHES FROM FULL DOWN



INTERVIEW CONFIDENTIALITY WITH ROCKET FOD FARMERS REMAINS

NOTES: 1. ON-30 CMM TURNTOP INSTALLED (STRESS POSITION)
2. TURN CIRCUMFERENTIAL DISPLACEMENT
LONGITUDINAL - 11.0 INCHES FROM STA. PERMANENT
LATERAL - 5 INCHES FROM FULL LEFT
DIAGONAL - 5 INCHES FROM FULL LEFT
COLLECTIVE - 12.92 INCHES FROM FULL DOWN

FIGURE No 16
 STATIC TRIM STABILITY
 AM-1G USAF/13443

HVV SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SWA	AVE ALT. H ₀ -FT.	AVE S.M. ~LB.	AVE LONG. CA-~IN.	ROTOR RPM	THRUST COEFF. ~C _T	FLT. COND.
0	3500	9555	200.0 (AFT)	524.5	0.005246	LEVEL FLT.
0	3260	9555	200.1 (AFT)	524.0	0.005461	DIVE

NOTES: 1. 1.14-28 CMH THROST. (INSTALLED) (STONES POSITION)

2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 10.83 INCHES FROM FULL FORWARD

LATERAL - 9.90 INCHES FROM FULL LEFT

DIRECTIONAL - 8.97 INCHES FROM FULL LEFT

COLLECTIVE - 8.98 INCHES FROM FULL DOWN

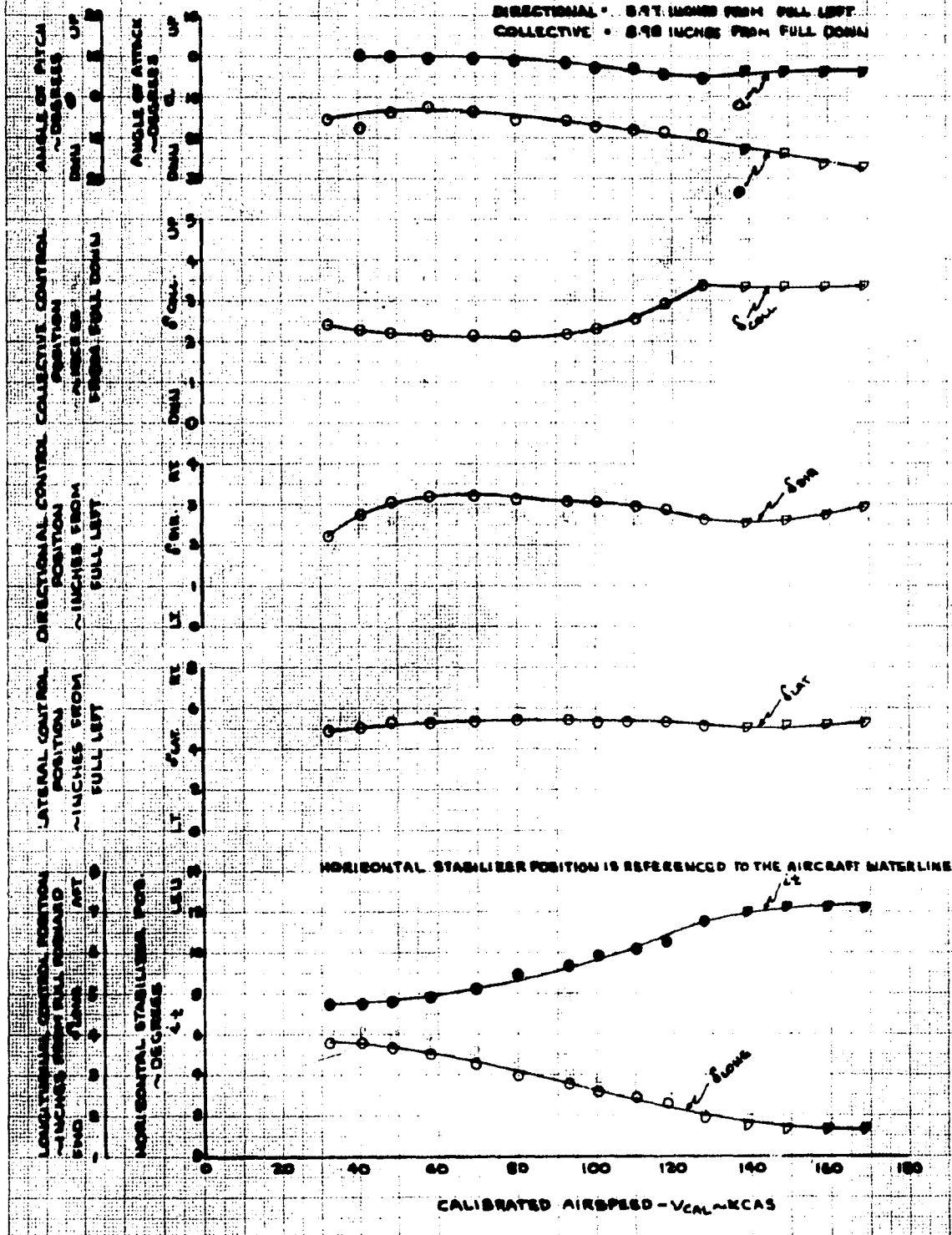


FIGURE No. 17
 STATIC TRIM STABILITY
 AH-1G: USAF 715698
 HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SVM	AVG. ALT. H ₀ - FT.	AVG. CN. ~ LB	AVG. LING. CG - IN	ROTOR RPM	THRUST COEFF. ~ C _T	FLT. COND.
0	4960	8630	191.8 (FWD)	524.0	0.004961	LEVEL FLT.
9	4760	8630	191.6 (FWD)	523.5	0.004937	DIVE

NOTES: 1. XM-28 CHIM THRUST INSTALLED (SHOWN POSITION)
 2. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD
 LATERAL - 9.0 INCHES FROM FULL LEFT
 DIRECTIONAL - 8.97 INCHES FROM FULL LEFT
 COLLECTIVE - 8.98 INCHES FROM FULL DOWN

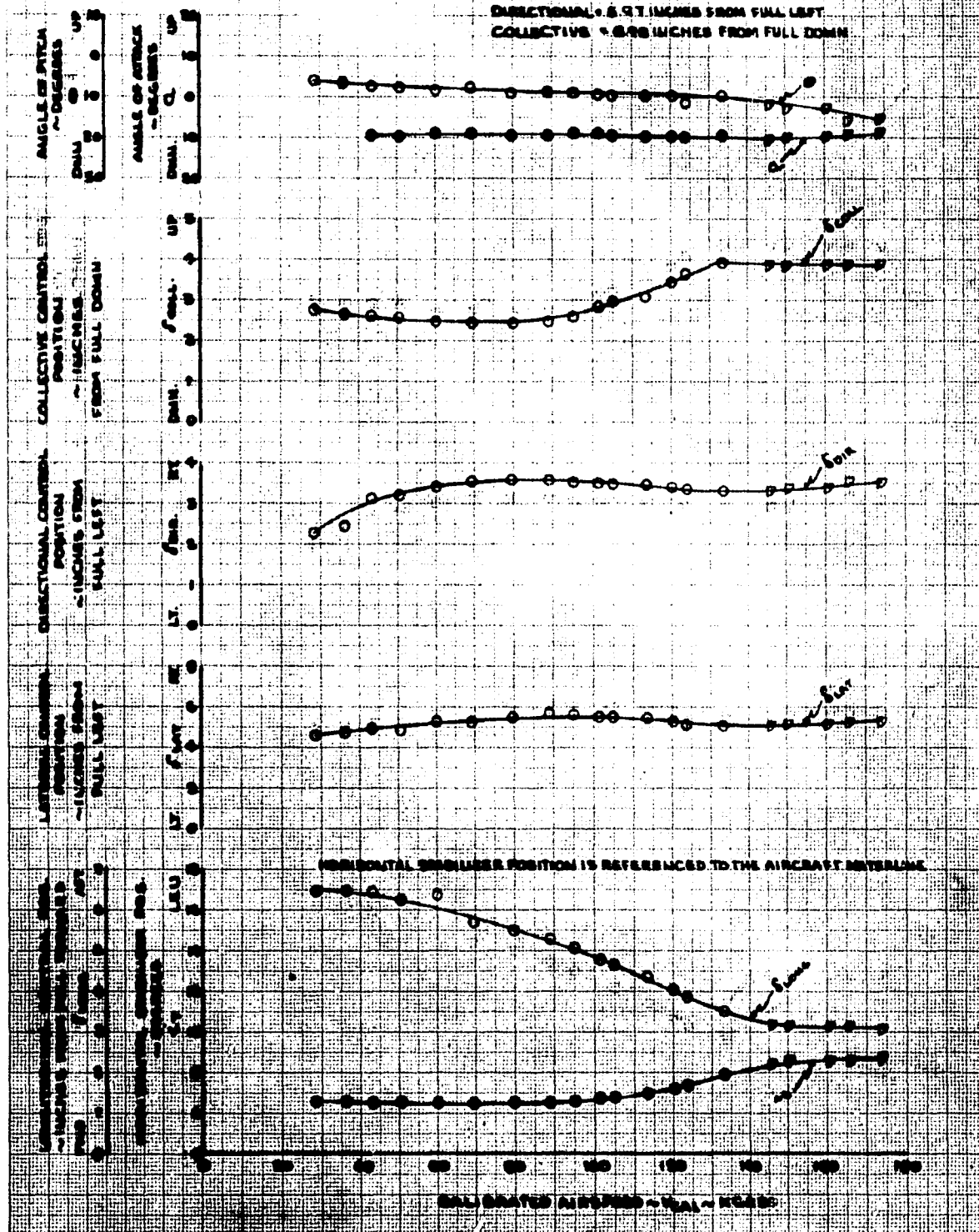


FIGURE NO. 19
STATIC TRIM STABILITY
AM-16 USAFUT15475

HVV HOG CONFIGURATION WITH REMOVED FAIRINGS REMOVED

SYM	AVE. ALT MO-FT	AVE. G.M. ~ LB.	AVE. LONG. CG ~ IN.	ROTOR RPM	THRUST COEFF. ~ CT	FLY. COND.
0	4440	4500	200.0 (WT)	325.0	0.001544	LEVEL FLT.
9	4650	4600	200.0 (WT)	325.0	0.000413	DIVE

NOTES: 1. AM-25 CHAINTREY INSTALLED (STANDARD POSITION)

2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD

LATERAL - 0.90 INCHES FROM FULL LEFT

DIRECTIONAL - 0.87 INCHES FROM FULL LEFT

COLLECTIVE - 0.90 INCHES FROM FULL DOWN

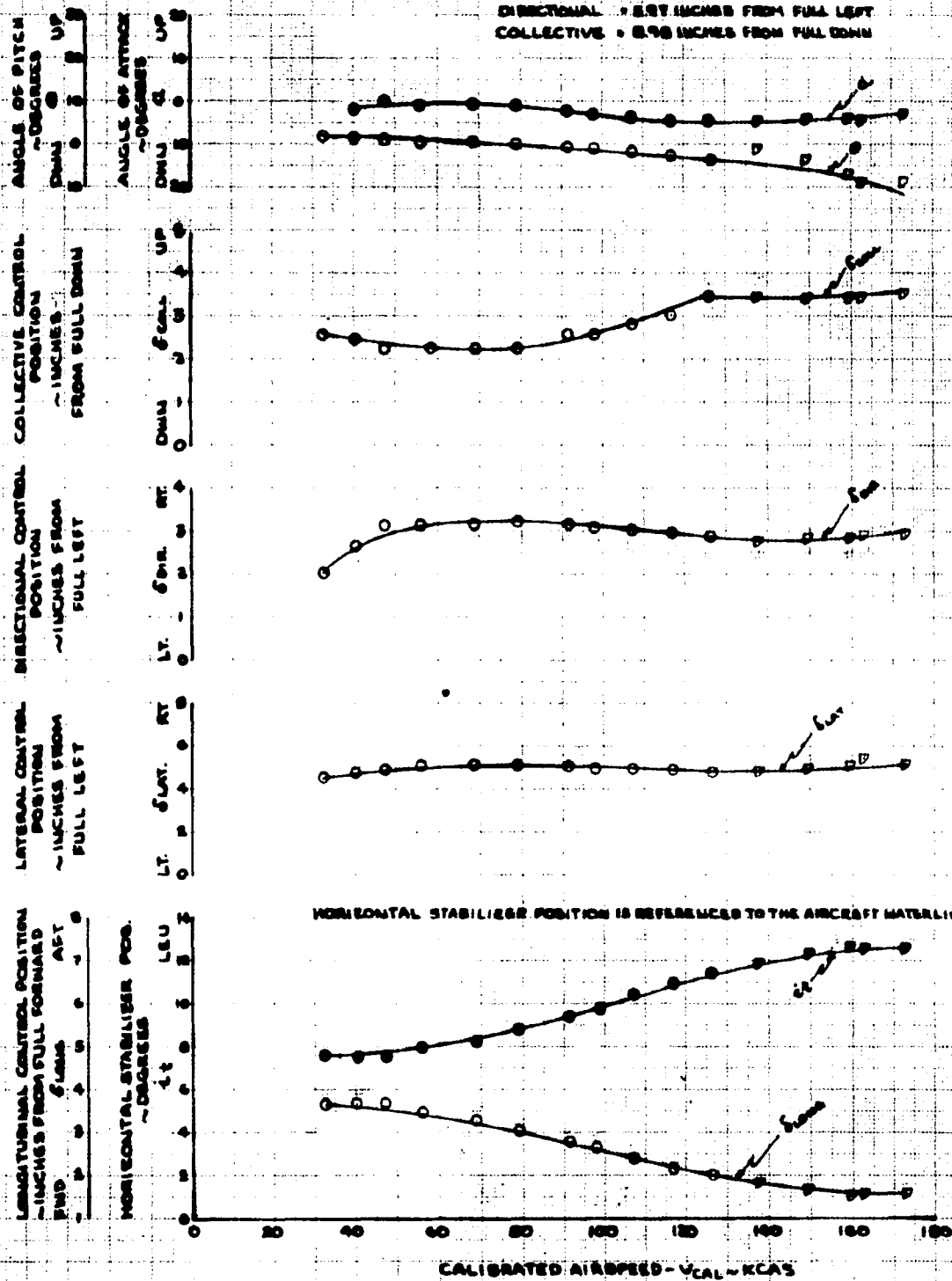


FIGURE NO 20
STATIC TRIM STABILITY
AM-16
USAF 15678

HVV. HQG CONFIGURATION WITH ROCKET PROPELLERS REMOVED

SYM	AVG ALT. H ₀ -FT	AVG S.M. -LB	AVG L.W. -LB	ROTOR RPM	THRUST COEFF -C _T	FLT COND.
0	14700	8400	2857 (MT)	233.0	0.00075	LEVEL FLT

NOTES: 1. 1/2 IN. CAN THROTTLE MECHANISM (REMOVED POSITION)
2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL: 10 INCHES FROM FULL DOWN
LATERAL: 4 INCHES FROM FULL LEFT
DIRECTIONAL: 5 INCHES FROM FULL LEFT
COLLECTIVE: 5 INCHES FROM FULL DOWN

ANGLE OF PITCH
-DEGREES
DOWN 0 UP
0 2 4 6 8

ANGLE OF ATTACK
-DEGREES
DOWN 0 UP
0 2 4 6 8

COLLECTIVE CONTROL
POSITION
-INCHES
FROM FULL DOWN
DOWN 0 UP
0 2 4 6 8

DIRECTIONAL CONTROL
POSITION
-INCHES FROM
FULL LEFT
DOWN 0 UP
0 2 4 6 8

LATERAL CONTROL
POSITION
-INCHES FROM
FULL LEFT
DOWN 0 UP
0 2 4 6 8

LONGITUDINAL CONTROL POSITION
-INCHES FROM FULL FORWARD
DOWN 0 UP
0 2 4 6 8

HORIZONTAL STABILIZER POSITION
-DEGREES
DOWN 0 UP
0 2 4 6 8

HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

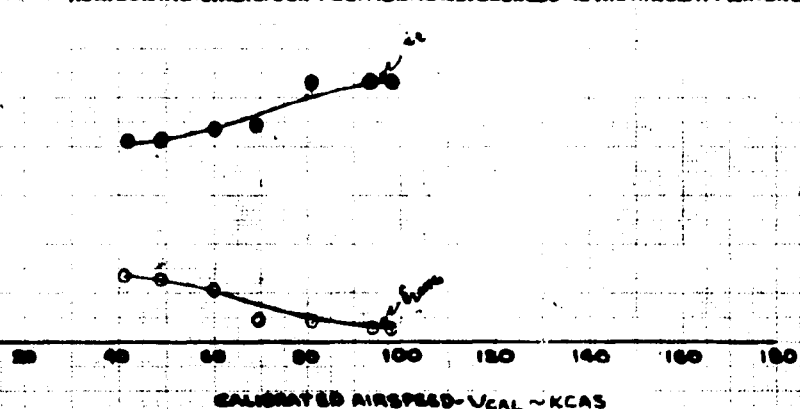


FIGURE 10-21
 STATIC TRIM STABILITY
 AN-16 USAF T15698
 CLEAN CONFIGURATION

SYM	AVE. ALT. H ₀ - FT	AVE. G.M. - LB	AVE. LONG. C.G. - IN.	ROTOR RPM	THRUST COEFF. - C _T	FLT. COND.
A	6850	6990	190.0 (FW)	323.0	0.004288	CLIMB
B	6660	7090	190.1 (FW)	321.0	0.004378	AUTOROTATION

NOTES: 1. 1/4-28 LHM THRUST INSTALLED (STOWED POSITION)

2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 10.25 INCHES FROM FULL FORWARD

LATERAL - 9.90 INCHES FROM FULL LEFT

DIRECTIONAL - 8.87 INCHES FROM FULL LEFT

COLLECTIVE - 8.98 INCHES FROM FULL DOWN

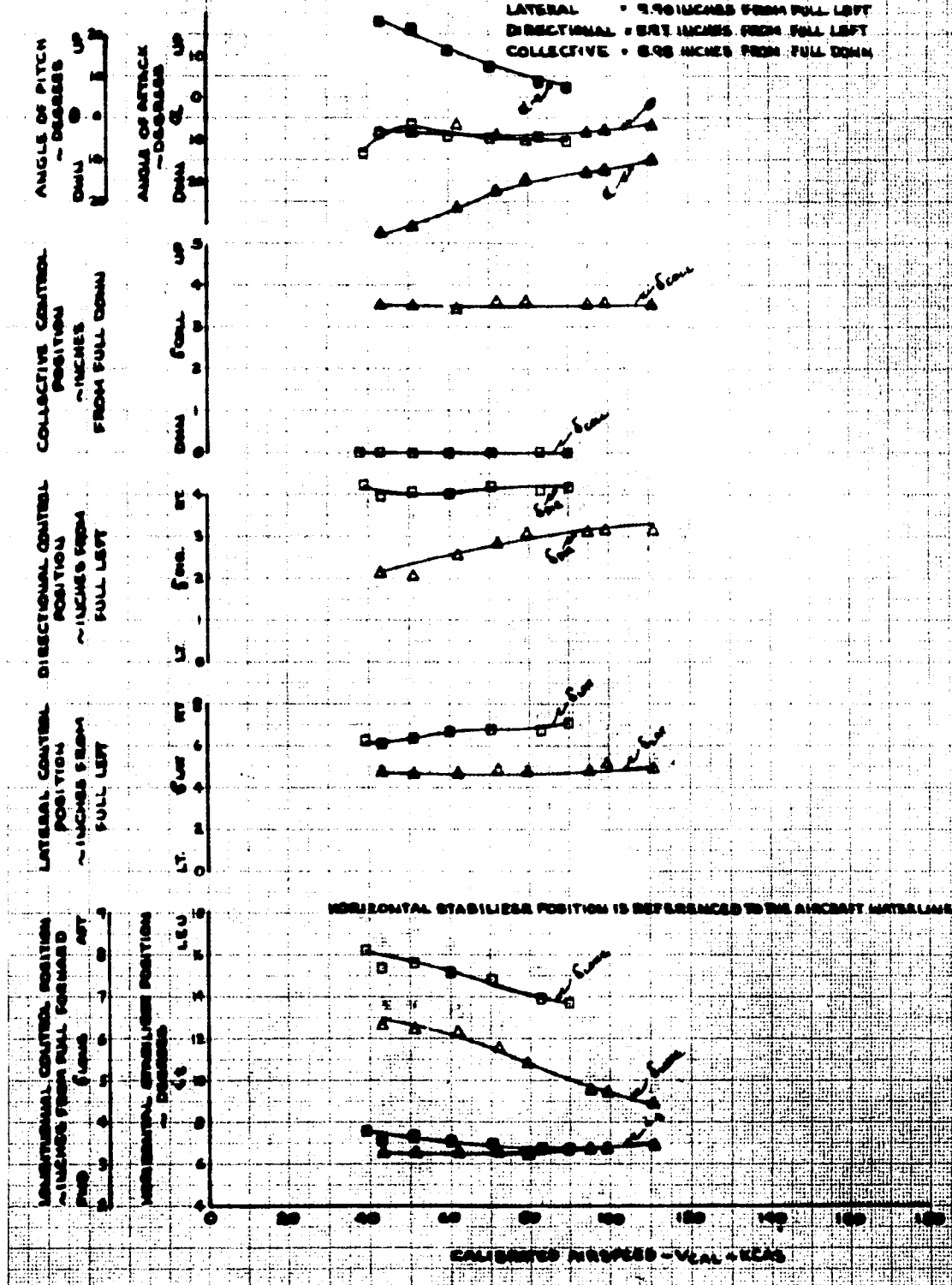


FIGURE NO 22
 STATIC TRIM STABILITY
 AH-1G USA 64715695
 CLEAN CONFIGURATION

SYM	AVG. ALT. ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C _T	FLT. COND.
A	5000	8240	191.1 (FW)	523.0	0.004778	CLIMB
B	5000	8240	191.2 (FW)	524.0	0.004777	AUTO ROTATION

NOTES: 1. KM-28 COW THRUST INSTALLED (STANDARD POSITION)

2. TRIM CONTROL DISPLACEMENT

LONGITUDINAL - 10.00 IN. FROM FULL FORWARD

LAGERAL - 4.90 IN. FROM FULL LEFT

DIRECTIONAL - 5.97 IN. FROM FULL LEFT

COLLECTIVE - 8.98 IN. FROM FULL DOWN

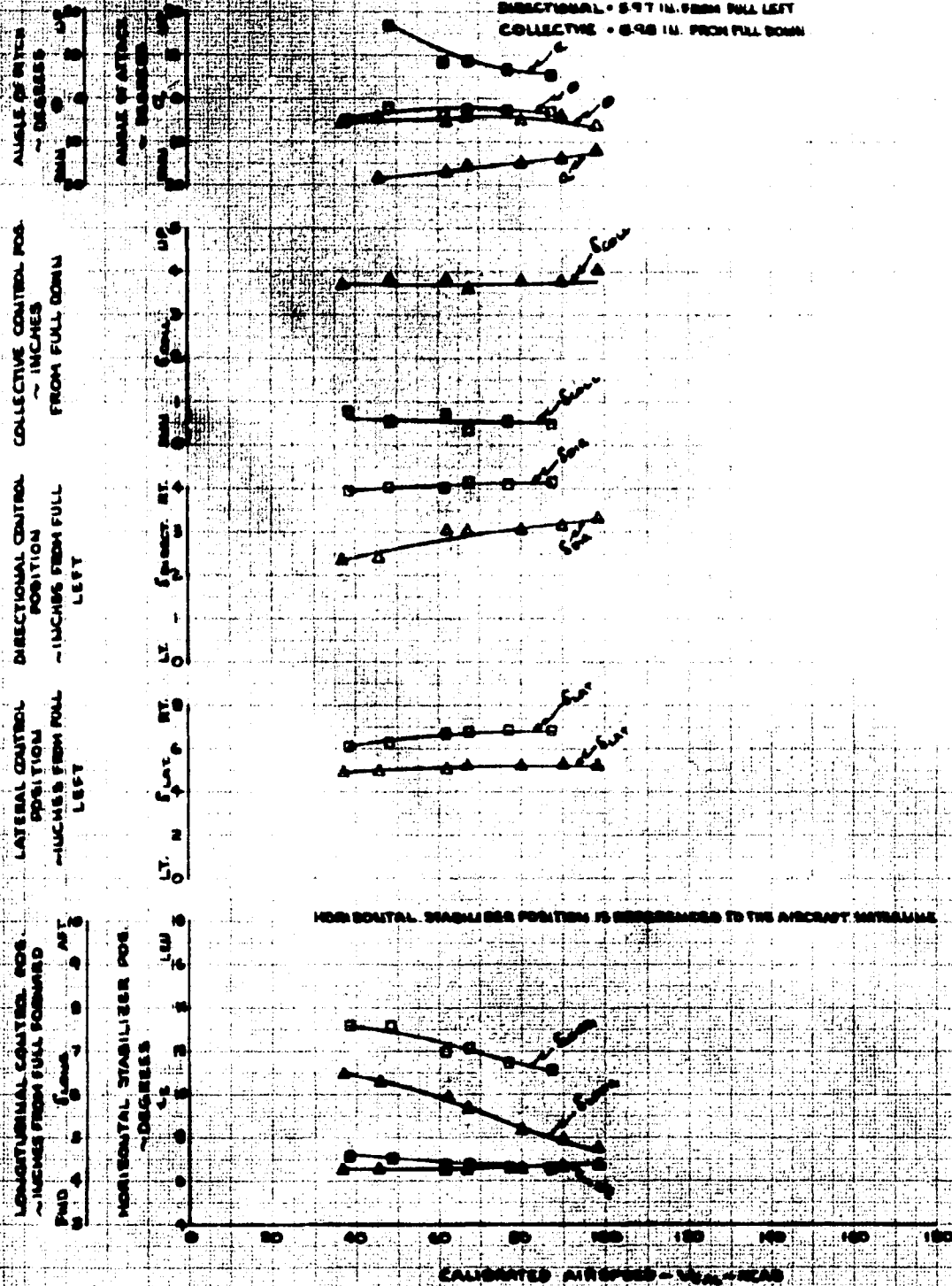


FIGURE 10-25
STATIC THROTTLEABILITY
 AP-10 USAF 15645
 CLEAN CONFIGURATION

WIND	WIND DIR	WIND SPS	WIND ANG	WIND	THROTTLE	FLY COND
A	000	010	25.1 (AST)	323.5	0.006700	CLIMB
B	000	010	25.1 (AST)	317.0	0.006910	AUTOTURN

APPROX. 10-20 CAN THROTTLE (THROTTLE POSITION)

2-TOTAL CENTER REPLACEMENT

LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD

LATERAL - 5.0 INCHES FROM FULL LEFT

DIRECTIONAL - 5.0 INCHES FROM FULL LEFT

COLLECTIVE - 5.0 INCHES FROM FULL DOWN

ANGLE OF ATTACK
 - DEGREES
 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213 214 215 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230 231 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246 247 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262 263 264 265 266 267 268 269 270 271 272 273 274 275 276 277 278 279 280 281 282 283 284 285 286 287 288 289 290 291 292 293 294 295 296 297 298 299 300 301 302 303 304 305 306 307 308 309 310 311 312 313 314 315 316 317 318 319 320 321 322 323 324 325 326 327 328 329 330 331 332 333 334 335 336 337 338 339 340 341 342 343 344 345 346 347 348 349 350 351 352 353 354 355 356 357 358 359 360 361 362 363 364 365 366 367 368 369 370 371 372 373 374 375 376 377 378 379 380 381 382 383 384 385 386 387 388 389 390 391 392 393 394 395 396 397 398 399 400 401 402 403 404 405 406 407 408 409 410 411 412 413 414 415 416 417 418 419 420 421 422 423 424 425 426 427 428 429 430 431 432 433 434 435 436 437 438 439 440 441 442 443 444 445 446 447 448 449 450 451 452 453 454 455 456 457 458 459 460 461 462 463 464 465 466 467 468 469 470 471 472 473 474 475 476 477 478 479 480 481 482 483 484 485 486 487 488 489 490 491 492 493 494 495 496 497 498 499 500 501 502 503 504 505 506 507 508 509 510 511 512 513 514 515 516 517 518 519 520 521 522 523 524 525 526 527 528 529 530 531 532 533 534 535 536 537 538 539 540 541 542 543 544 545 546 547 548 549 550 551 552 553 554 555 556 557 558 559 560 561 562 563 564 565 566 567 568 569 570 571 572 573 574 575 576 577 578 579 580 581 582 583 584 585 586 587 588 589 590 591 592 593 594 595 596 597 598 599 600 601 602 603 604 605 606 607 608 609 610 611 612 613 614 615 616 617 618 619 620 621 622 623 624 625 626 627 628 629 630 631 632 633 634 635 636 637 638 639 640 641 642 643 644 645 646 647 648 649 650 651 652 653 654 655 656 657 658 659 660 661 662 663 664 665 666 667 668 669 670 671 672 673 674 675 676 677 678 679 680 681 682 683 684 685 686 687 688 689 690 691 692 693 694 695 696 697 698 699 700 701 702 703 704 705 706 707 708 709 710 711 712 713 714 715 716 717 718 719 720 721 722 723 724 725 726 727 728 729 730 731 732 733 734 735 736 737 738 739 740 741 742 743 744 745 746 747 748 749 750 751 752 753 754 755 756 757 758 759 760 761 762 763 764 765 766 767 768 769 770 771 772 773 774 775 776 777 778 779 780 781 782 783 784 785 786 787 788 789 790 791 792 793 794 795 796 797 798 799 800 801 802 803 804 805 806 807 808 809 810 811 812 813 814 815 816 817 818 819 820 821 822 823 824 825 826 827 828 829 830 831 832 833 834 835 836 837 838 839 840 841 842 843 844 845 846 847 848 849 850 851 852 853 854 855 856 857 858 859 860 861 862 863 864 865 866 867 868 869 870 871 872 873 874 875 876 877 878 879 880 881 882 883 884 885 886 887 888 889 890 891 892 893 894 895 896 897 898 899 900 901 902 903 904 905 906 907 908 909 910 911 912 913 914 915 916 917 918 919 920 921 922 923 924 925 926 927 928 929 930 931 932 933 934 935 936 937 938 939 940 941 942 943 944 945 946 947 948 949 950 951 952 953 954 955 956 957 958 959 960 961 962 963 964 965 966 967 968 969 970 971 972 973 974 975 976 977 978 979 980 981 982 983 984 985 986 987 988 989 990 991 992 993 994 995 996 997 998 999 1000 1001 1002 1003 1004 1005 1006 1007 1008 1009 1010 1011 1012 1013 1014 1015 1016 1017 1018 1019 1020 1021 1022 1023 1024 1025 1026 1027 1028 1029 1030 1031 1032 1033 1034 1035 1036 1037 1038 1039 1040 1041 1042 1043 1044 1045 1046 1047 1048 1049 1050 1051 1052 1053 1054 1055 1056 1057 1058 1059 1060 1061 1062 1063 1064 1065 1066 1067 1068 1069 1070 1071 1072 1073 1074 1075 1076 1077 1078 1079 1080 1081 1082 1083 1084 1085 1086 1087 1088 1089 1090 1091 1092 1093 1094 1095 1096 1097 1098 1099 1100 1101 1102 1103 1104 1105 1106 1107 1108 1109 1110 1111 1112 1113 1114 1115 1116 1117 1118 1119 1120 1121 1122 1123 1124 1125 1126 1127 1128 1129 1130 1131 1132 1133 1134 1135 1136 1137 1138 1139 1140 1141 1142 1143 1144 1145 1146 1147 1148 1149 1150 1151 1152 1153 1154 1155 1156 1157 1158 1159 1160 1161 1162 1163 1164 1165 1166 1167 1168 1169 1170 1171 1172 1173 1174 1175 1176 1177 1178 1179 1180 1181 1182 1183 1184 1185 1186 1187 1188 1189 1190 1191 1192 1193 1194 1195 1196 1197 1198 1199 1200 1201 1202 1203 1204 1205 1206 1207 1208 1209 1210 1211 1212 1213 1214 1215 1216 1217 1218 1219 1220 1221 1222 1223 1224 1225 1226 1227 1228 1229 1230 1231 1232 1233 1234 1235 1236 1237 1238 1239 1240 1241 1242 1243 1244 1245 1246 1247 1248 1249 1250 1251 1252 1253 1254 1255 1256 1257 1258 1259 1260 1261 1262 1263 1264 1265 1266 1267 1268 1269 1270 1271 1272 1273 1274 1275 1276 1277 1278 1279 1280 1281 1282 1283 1284 1285 1286 1287 1288 1289 1290 1291 1292 1293 1294 1295 1296 1297 1298 1299 1300 1301 1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321 1322 1323 1324 1325 1326 1327 1328 1329 1330 1331 1332 1333 1334 1335 1336 1337 1338 1339 1340 1341 1342 1343 1344 1345 1346 1347 1348 1349 1350 1351 1352 1353 1354 1355 1356 1357 1358 1359 1360 1361 1362 1363 1364 1365 1366 1367 1368 1369 1370 1371 1372 1373 1374 1375 1376 1377 1378 1379 1380 1381 1382 1383 1384 1385 1386 1387 1388 1389 1390 1391 1392 1393 1394 1395 1396 1397 1398 1399 1400 1401 1402 1403 1404 1405 1406 1407 1408 1409 1410 1411 1412 1413 1414 1415 1416 1417 1418 1419 1420 1421 1422 1423 1424 1425 1426 1427 1428 1429 1430 1431 1432 1433 1434 1435 1436 1437 1438 1439 1440 1441 1442 1443 1444 1445 1446 1447 1448 1449 1450 1451 1452 1453 1454 1455 1456 1457 1458 1459 1460 1461 1462 1463 1464 1465 1466 1467 1468 1469 1470 1471 1472 1473 1474 1475 1476 1477 1478 1479 1480 1481 1482 1483 1484 1485 1486 1487 1488 1489 1490 1491 1492 1493 1494 1495 1496 1497 1498 1499 1500 1501 1502 1503 1504 1505 1506 1507 1508 1509 1510 1511 1512 1513 1514 1515 1516 1517 1518 1519 1520 1521 1522 1523 1524 1525 1526 1527 1528 1529 1530 1531 1532 1533 1534 1535 1536 1537 1538 1539 1540 1541 1542 1543 1544 1545 1546 1547 1548 1549 1550 1551 1552 1553 1554 1555 1556 1557 1558 1559 1560 1561 1562 1563 1564 1565 1566 1567 1568 1569 1570 1571 1572 1573 1574 1575 1576 1577 1578 1579 1580 1581 1582 1583 1584 1585 1586 1587 1588 1589 1590 1591 1592 1593 1594 1595 1596 1597 1598 1599 1600 1601 1602 1603 1604 1605 1606 1607 1608 1609 1610 1611 1612 1613 1614 1615 1616 1617 1618 1619 1620 1621 1622 1623 1624 1625 1626 1627 1628 1629 1630 1631 1632 1633 1634 1635 1636 1637 1638 1639 1640 1641 1642 1643 1644 1645 1646 1647 1648 1649 1650 1651 1652 1653 1654 1655 1656 1657 1658 1659 1660 1661 1662 1663 1664 1665 1666 1667 1668 1669 1670 1671 1672 1673 1674 1675 1676 1677 1678 1679 1680 1681 1682 1683 1684 1685 1686 1687 1688 1689 1690 1691 1692 1693 1694 1695 1696 1697 1698 1699 1700 1701 1702 1703 1704 1705 1706 1707 1708 1709 1710 1711 1712 1713 1714 1715 1716 1717 1718 1719 1720 1721 1722 1723 1724 1725 1726 1727 1728 1729 1730 1731 1732 1733 1734 1735 1736 1737 1738 1739 1740 1741 1742 1743 1744 1745 1746 1747 1748 1749 1750 1751 1752 1753 1754 1755 1756 1757 1758 1759 1760 1761 1762 1763 1764 1765 1766 1767 1768 1769 1770 1771 1772 1773 1774 1775 1776 1777 1778 1779 1780 1781 1782 1783 1784 1785 1786 1787 1788 1789 1790 1791 1792 1793 1794 1795 1796 1797 1798 1799 1800 1801 1802 1803 1804 1805 1806 1807 1808 1809 1810 1811 1812 1813 1814 1815 1816 1817 1818 1819 1820 1821 1822 1823 1824 1825 1826 1827 1828 1829 1830 1831 1832 1833 1834 1835 1836 1837 1838 1839 1840 1841 1842 1843 1844 1845 1846 1847 1848 1849 1850 1851 1852 1853 1854 1855 1856 1857 1858 1859 1860 1861 1862 1863 1864 1865 1866 1867 1868 1869 1870 1871 1872 1873 1874 1875 1876 1877 1878 1879 1880 1881 1882 1883 1884 1885 1886 1887 1888 1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939 1940 1941 1942 1943 1944 1945 1946 1947 1948 1949 1950 1951 1952 1953 1954 1955 1956 1957 1958 1959 1960 1961 1962 1963 1964 1965 1966 1967 1968 1969 1970 1971 1972 1973 1974 1975 1976 1977 1978 1979 1980 1981 1982 1983 1984 1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034 2035 2036 2037 2038 2039 2040 2041 2042 2043 2044 2045 2046 2047 2048 2049 2050 2051 2052 2053 2054 2055 2056 2057 2058 2059 2060 2061 2062 2063 2064 2065 2066 2067 2068 2069 2070 2071 2072 2073 2074 2075 2076 2077 2078 2079 2080 2081 2082 2083 2084 2085 2086 2087 2088 2089 2090 2091 2092 2093 2094 2095 2096 2097 2098 2099 2100 2101 2102 2103 2104 2105 2106 2107 2108 2109 2110 2111 2112 2113 2114 2115 2116 2117 2118 2119 2120 2121 2122 2123 2124 2125 2126 2127 2128 2129 2130 2131 2132 2133 2134 2135 2136 2137 2138 2139 2140 2141 2142 2143 2144 2145 2146 2147 2148 2149 2150 2151 2152 2153 2154 2155 2156 2157 2158 2159 2160 2161 2162 2163 2164 2165 2166 2167 2168 2169 2170 2171 2172 2173 2174 2175 2176 2177 2178 2179 2180 2181 2182 2183 2184 2185 2186 2187 2188 2189 2190 2191 2192 2193 2194 2195 2196 2197 2198 2199 2200 2201 2202 2203 2204 2205 2206 2207 2208 2209 2210 2211 2212 2213 2214 2215 2216 2217 2218 2219 2220 2221 2222 2223 2224 2225 2226 2227 2228 2229 2230 2231 2232 2233 2234 2235 2236 2237 2238 2239 2240 2241 2242 2243 2244 2245 2246 2247 2248 2249 2250 2251 2252 2253 2254 2255 2256 2257 2258 2259 2260 2261 2262 2263 2264 2265 2266 2267 2268 2269 2270 2271 2272 2273 2274 2275 2276 2277 2278 2279 2280 2281 2282 2283 2284 2285 2286 2287 2288 2289 2290 2291 2292 2293 2294 2295 2296 2297 2298 2299 2300 2301 2302 2303 2304 2305 2306 2307 2308 2309 2310 2311 2312 2313 2314 2315 2316 2317 2318 2319 2320 2321 2322 2323 2324 2325 2326 2327 2328 2329 2330 2331 2332 2333 2334 2335 2336 2337 2338 2339 2340 2341 2342 2343 2344 2345 2346 2347 2348 2349 2350 2351 2352 2353 2354 2355 2356 2357 2358 2359 2360 2361 2362 2363 2364 2365 2366 2367 2368 2369 2370 2371 2372 2373 2374 2375 2376 2377 2378 2379 2380 2381 2382 2383 2384 2385 2386 2387 2388 2389 2390 2391 2392 2393 2394 2395 2396 2397 2398 2399 2400 2401 2402 2403 2404 2405 2406 2407 2408 2409 2410 2411 2412 2413 2414 2415 2416 2417 2418 2419 2420 2421 2422 2423 2424 2425 2426 2427 2428 2429 2430 2431 2432 2433 2434 2435 2436 2437 2438 2439 2440 2441 2442 2443 2444 2445 2446 2447 2448 2449 2450 2451 2452 2453 2454 2455 2456 2457 2458 2459 2460 2461 2462 2463 2464 2465 2466 2467 2468 2469 2470 2471 2472 2473 2474 2475 2476 2477 2478 2479 2480 2481 2482 2483 2484 2485 2486 2487 2488 2489 2490 2491 2492 2493 2494 2495 2496 2497 2498 2499 2500 2501 2502 2503 2504 2505 2506 2507 2508 2509 2510 2511 2512 2513 2514 2515 2516 2517 2518 2519 2520 2521 2522 2523 2524 2525 2526 2527 2528 2529 2530 2531 2532 2533 2534 2535 2536 2537 2538 2539 2540 2541 2542 2543 2544 2545 2546 2547 2548 2549 2550 2551 2552 2553 2554 2555 2556 2557 2558 2559 2560 2561 2562 2563 2564

FIGURE No. 24
STATIC TRIM STABILITY

AM-16 USA 84118498

HYDRO CONFIGURATION: 100% WITH RECESS AND CANNONS REMOVED

WING	WING ALT	WING ALT	WING ALT	WING	THROTTLE	THROTTLE	FLT. COND.
WING	WING ALT	WING ALT	WING ALT	WING	THROTTLE	THROTTLE	FLT. COND.
▲	8400	8400	100-1000	8400	8400	8400	CLOSE
●	8400	8400	100-1000	8400	8400	8400	ADJUSTMENT

MODEL 1. 100% CAN TRIM STABILITY (TRIM POSITION)

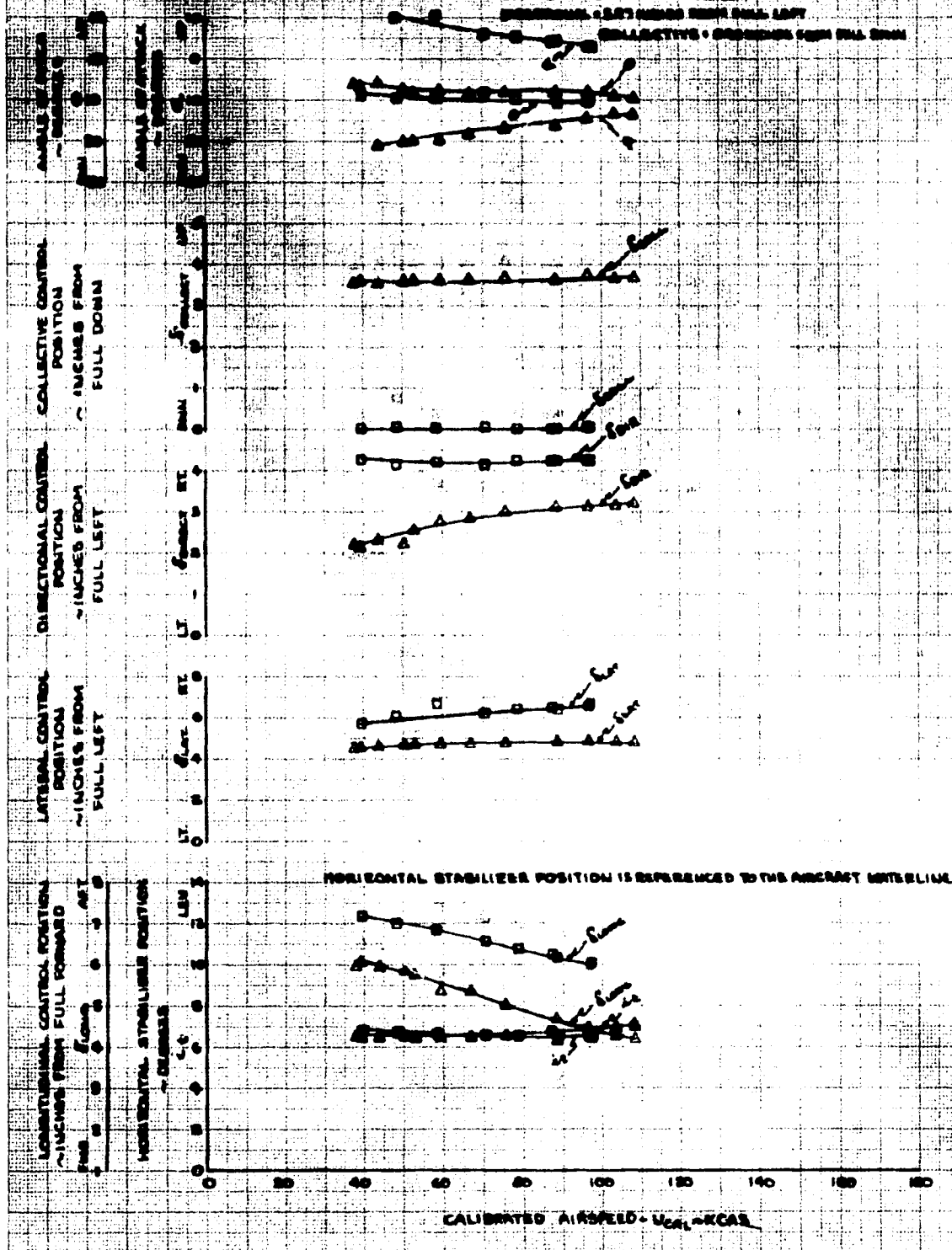
2. TOTAL TRIM DISPLACEMENT

3. TOTAL TRIM DISPLACEMENT

4. TOTAL TRIM DISPLACEMENT

5. TOTAL TRIM DISPLACEMENT

6. TOTAL TRIM DISPLACEMENT



Form No. 25
Stability
Part 1 - USA
Sheet 1 of 1

FOR USE IN CONNECTION WITH THE STABILITY FORMS

NO.	NAME	AGE	SEX	DATE	TIME	FLY. COND.
1	1000	1000	1000	1000	1000	CLIMB
2	1000	1000	1000	1000	1000	AUTOTURN

NOTES: 1. 25-25 CHIN TUBES INSTALLED (SPINNING POSITION)
 2. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.00 IN. FROM FULL FORWARD
 LATERAL - 9.00 IN. FROM FULL LEFT
 DIRECTIONAL - 5.97 IN. FROM FULL LEFT
 COLLECTIVE - 5.90 IN. FROM FULL DOWN

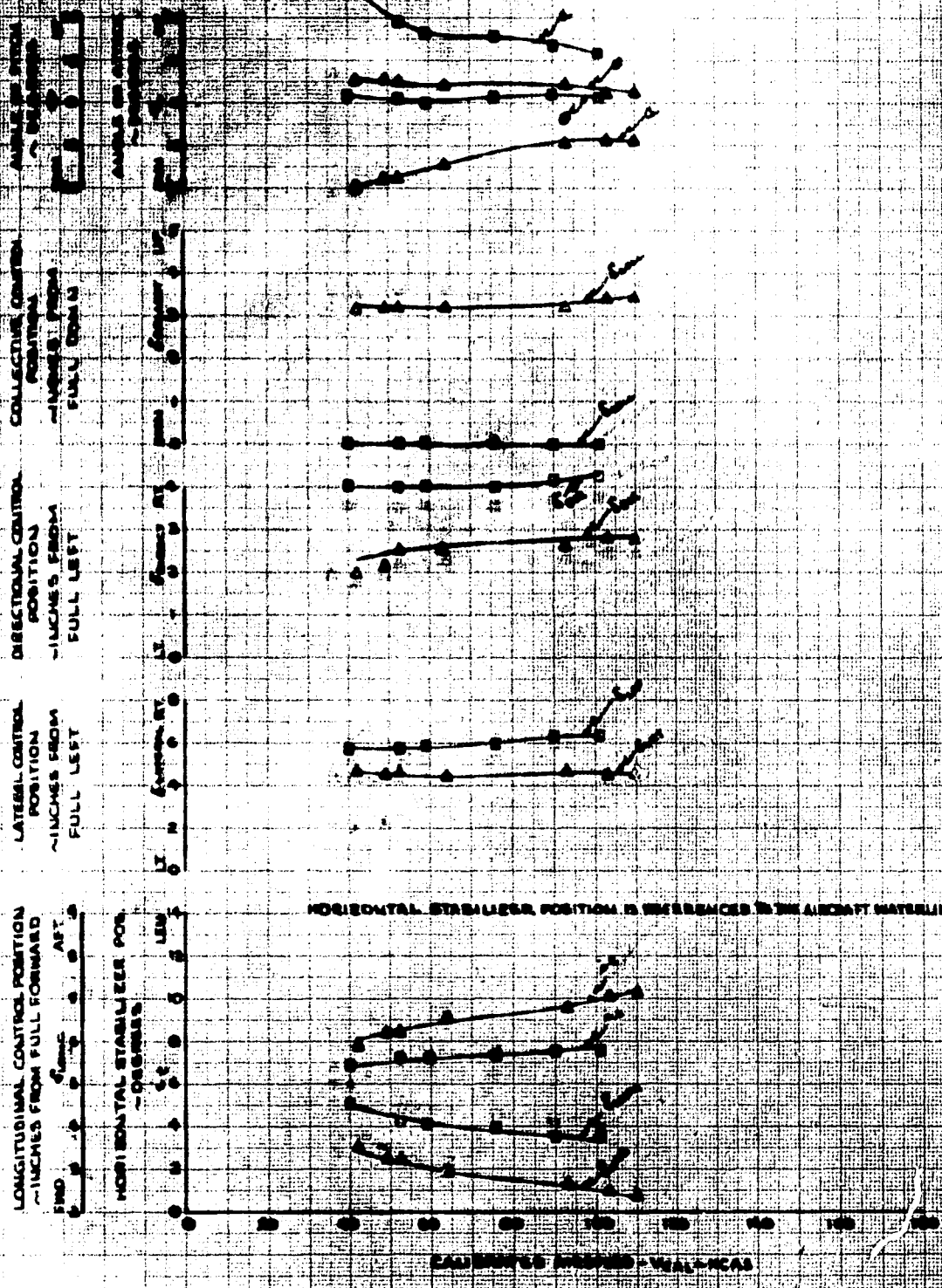


FIGURE No. 26
STATIC TRIM STABILITY
 AN-18 USARV 15475

NAVY HQG CONFIGURATION WITH SOCKET FOD FAIRINGS REMOVED

SYM	WING ALT IN - FT	WING CN - LB	WING LENS CG - IN	RETOR RPM	THRUST CFT - C _T	FLY. COND
A	5670	4330	200.1 (APT)	324.0	0.005448	CLIMB
B	4950	4330	200.2 (APT)	331.0	0.005181	AUTOREST

NOTES: 1. 204-28 CMH TURBET INSTALLED (DOWNED POSITION)

2. TOTAL CENTER DISPLACEMENT:

LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD

LATERAL - 2.00 INCHES FROM FULL LEFT

DIRECTIONAL - 3.63 INCHES FROM FULL LEFT

COLLECTIVE - 2.00 INCHES FROM FULL DOWN

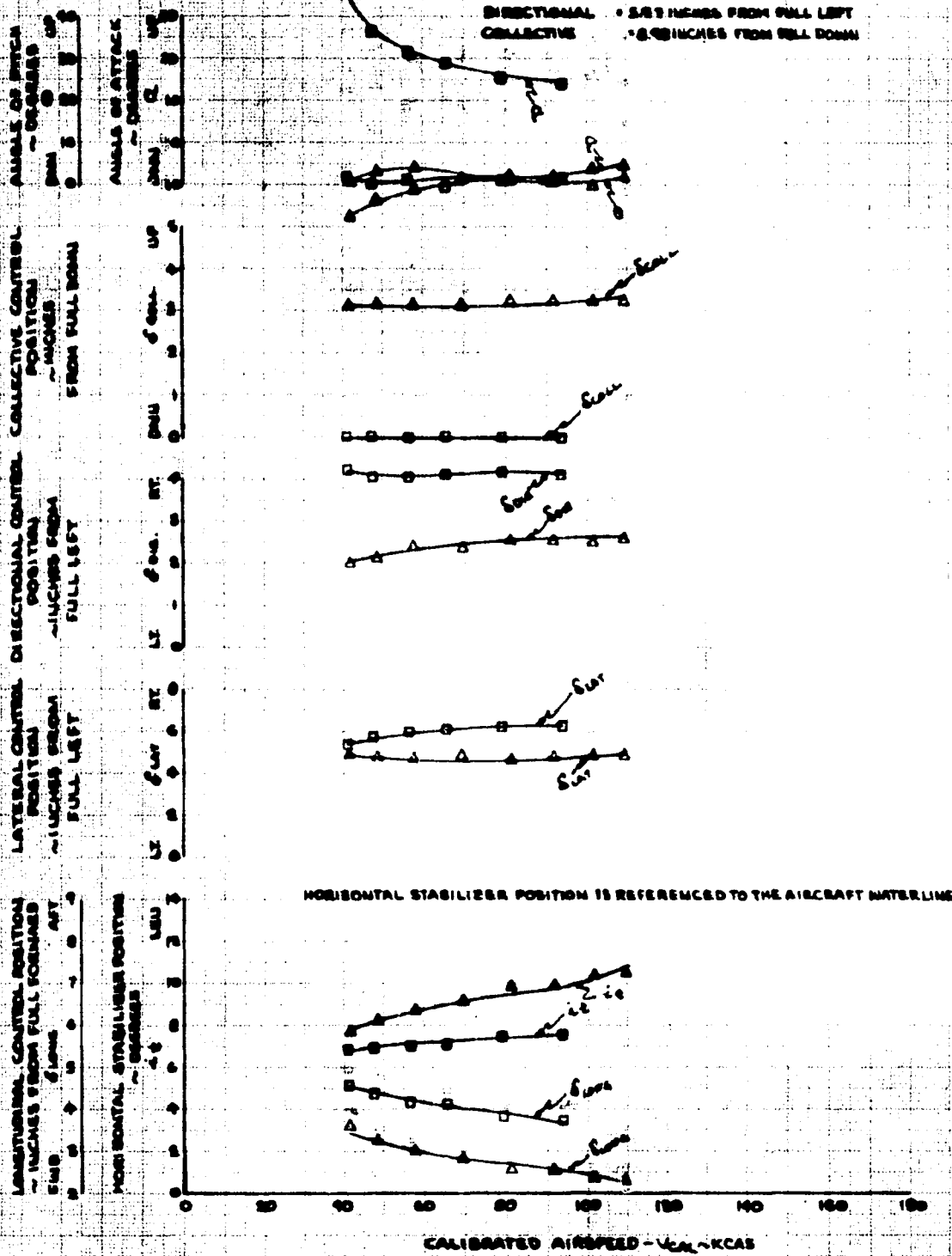


FIGURE No 27
STATIC TRIM STABILITY

AH-1G USA 2612347

CLEAN CONFIGURATION SKID TUBE FAIRINGS OFF

SYM	AVG. ALT. ~FT.	AVG. G.M. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	THRUST COEFF. ~CT	FLT. COND.
0	3000	8840	198.9 (MT)	323.0	0.004864	LEVEL FLT.
9	3190	8665	199.8 (MT)	323.0	0.004887	DIVE

NOTES: 1. TAT 102 CHIU THRUST INSTALLED (STOWED POSITION)
2. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 9.07 IN. FROM FULL FORWARD

LATERAL - 10.00 IN. FROM FULL LEFT

DIRECTIONAL - 7.07 IN. FROM FULL LEFT

COLLECTIVE - 9.30 IN. FROM FULL DOWN

ANGLE OF ATTACK INOPERATIVE

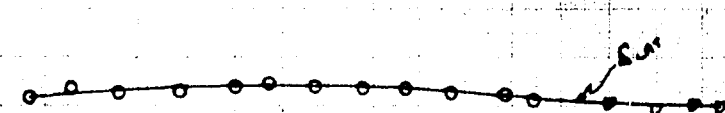
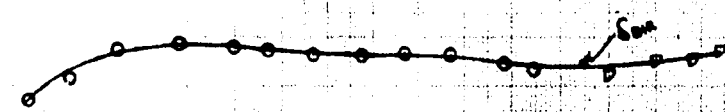
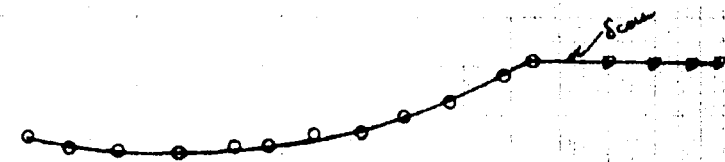
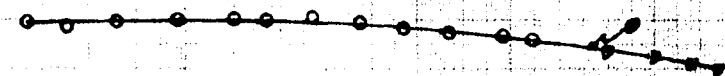
ANGLE OF PITCH
~DEGREES
DOWN UP

COLLECTIVE CONTROL
POSITION
~INCHES FROM
FULL DOWN
DOWN UP

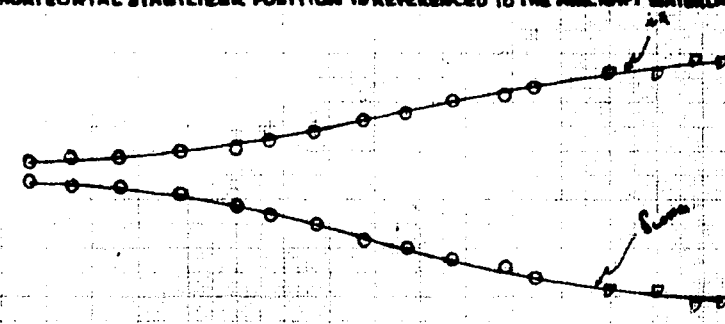
DIRECTIONAL CONTROL
POSITION
~INCHES FROM
FULL LEFT
LT. RT.

LATERAL CONTROL
POSITION
~INCHES FROM
FULL LEFT
LT. RT.

LONGITUDINAL CONTROL POSITION
~INCHES FROM FULL FORWARD
FWD AFT
HORIZONTAL STABILIZER POS.
~DEGREES
DOWN UP



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE



CALIBRATED AIRSPEED ~ V_{CL} ~ KCAS

FIGURE No 28
SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USAF 718695
GROSS WEIGHT COMPARISON

SYM	AVG ALT. Hq-FL.	AVG GROSS WT.-LB.	MT. ANGLE C.G.-IN.	ROTOR RPM	CONFIG.	THRUST COEFF. C _T
○	8710	8460	288.0 (WT)	232.0	HYV. WEA	0.007082
●	8820	9140	288.0 (WT)	232.0	HYV. WEA	0.006979
◐	8820	8010	201.0 (WT)	232.0	HYV. WEA	0.007448
◑	87	9280	200.0 (WT)	232.0	HYV. SCDF	0.006448
▼	5720	8010	200.0 (WT)	232.0	OUTED ALT.	0.007932
◊	4430	8190	201.0 (WT)	232.0	OUTED ALT.	0.004715

- NOTES: 1. POINTS DERIVED FROM FIGURES 43 THROUGH 45, 48 THROUGH 51, AND 54 THROUGH 61, APPENDIX VII
 2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
 3. CROSSED SYMBOLS DENOTE DIVE
 4. FLAGGED SYMBOLS DENOTE CLIMB
 5. TRIED SYMBOLS DENOTE AUTOROTATION

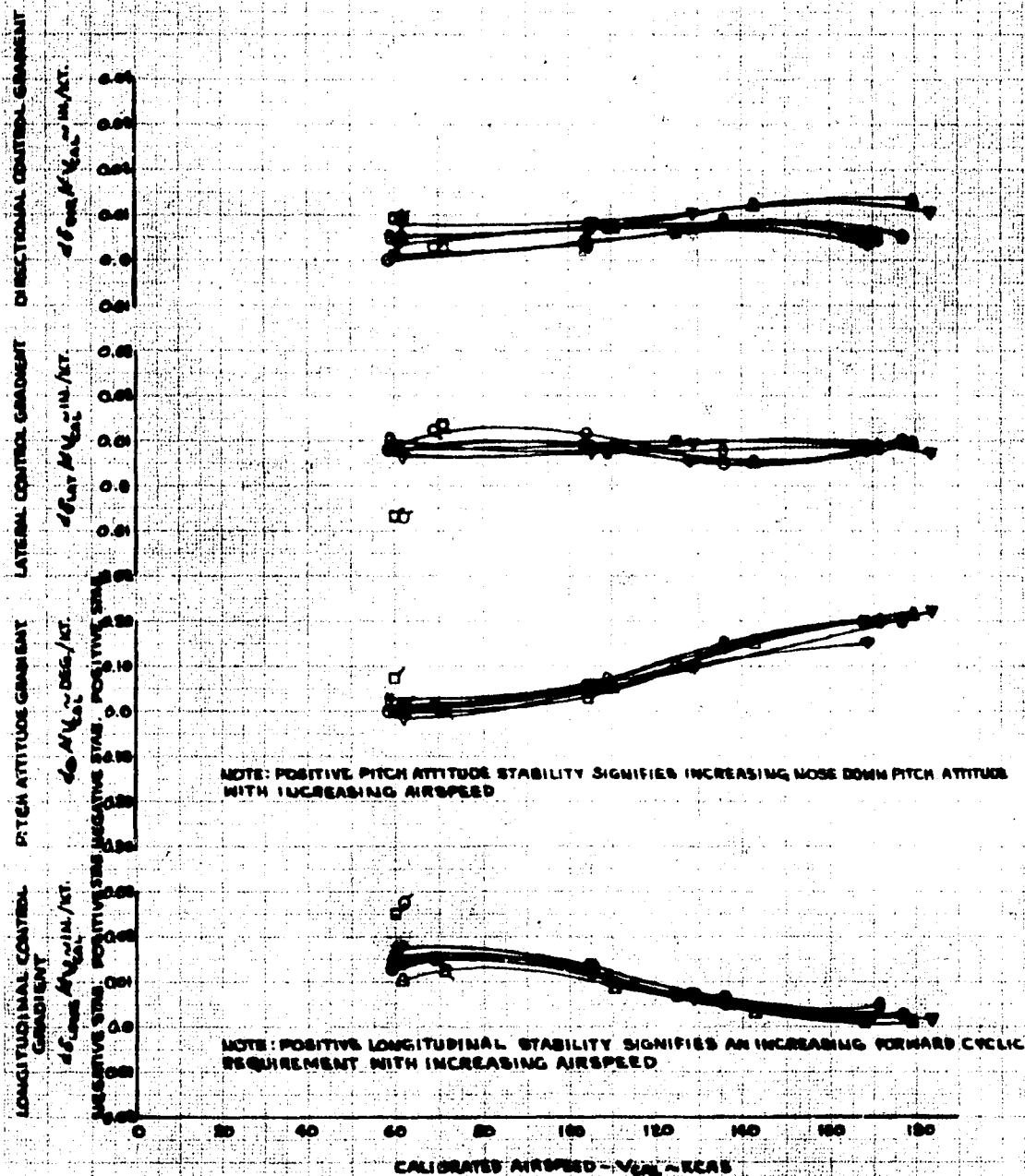


FIGURE NO. 29
SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USAF T15693
CENTER OF GRAVITY COMPARISON

SYM	AVG. ALT. H _g ~ FT.	AVG. GROSS WT. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C _T
○	8810	8460	2008(AFT)	322.0	HVY. HOG	0.004982
△	8780	8400	2010(AFT)	322.5	CLEAN	0.004917
◊	8760	8400	191.0(FWD)	321.5	HVY. HOG	0.004964
○	8760	8280	191.1(FWD)	324.0	CLEAN	0.004874

NOTES: 1. POINTS DERIVED FROM FIGURES 33 THROUGH 40 AND 53
THROUGH 58, APPENDIX III
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION

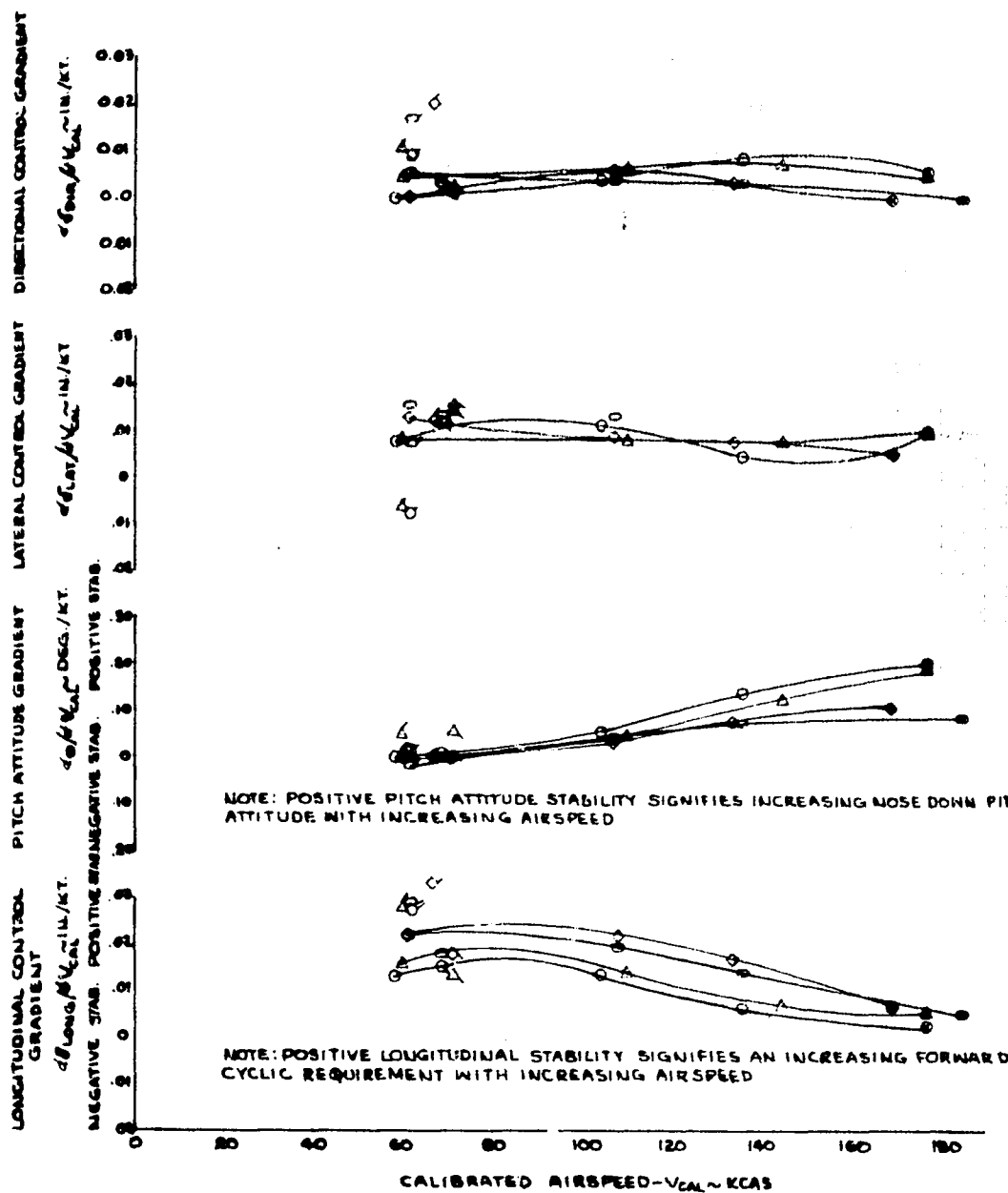


FIGURE No. 30
SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USAF 715695
ALTITUDE COMPARISON

SYM	AVG ALT. H ₀ ~ FT.	AVG GROSS WT. ~ LB	AVG LONG C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF ~ C _T
Δ	5780	8408	201.1 (AFT)	322.5	CLEAN	0.004817
○	5320	8415	201.0 (AFT)	324.5	HVY ROBT	0.004649
○	5310	8460	200.8 (AFT)	322.0	HVY. HOG	0.004982
Δ	4970	8190	201.0 (AFT)	324.0	OUT'D ALT	0.004773
○	15620	8150	201.1 (AFT)	322.5	CLEAN	0.006581
○	14640	8570	208.7 (AFT)	323.5	HVY. HOG	0.006700
○	14650	8180	201.7 (AFT)	323.5	OUT'D ALT	0.006402

NOTES: 1. POINTS DERIVED FROM FIGURES 30 THROUGH 42, 45 THROUGH 50, 56 THROUGH 58, 62 AND 63, APPENDIX II
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION

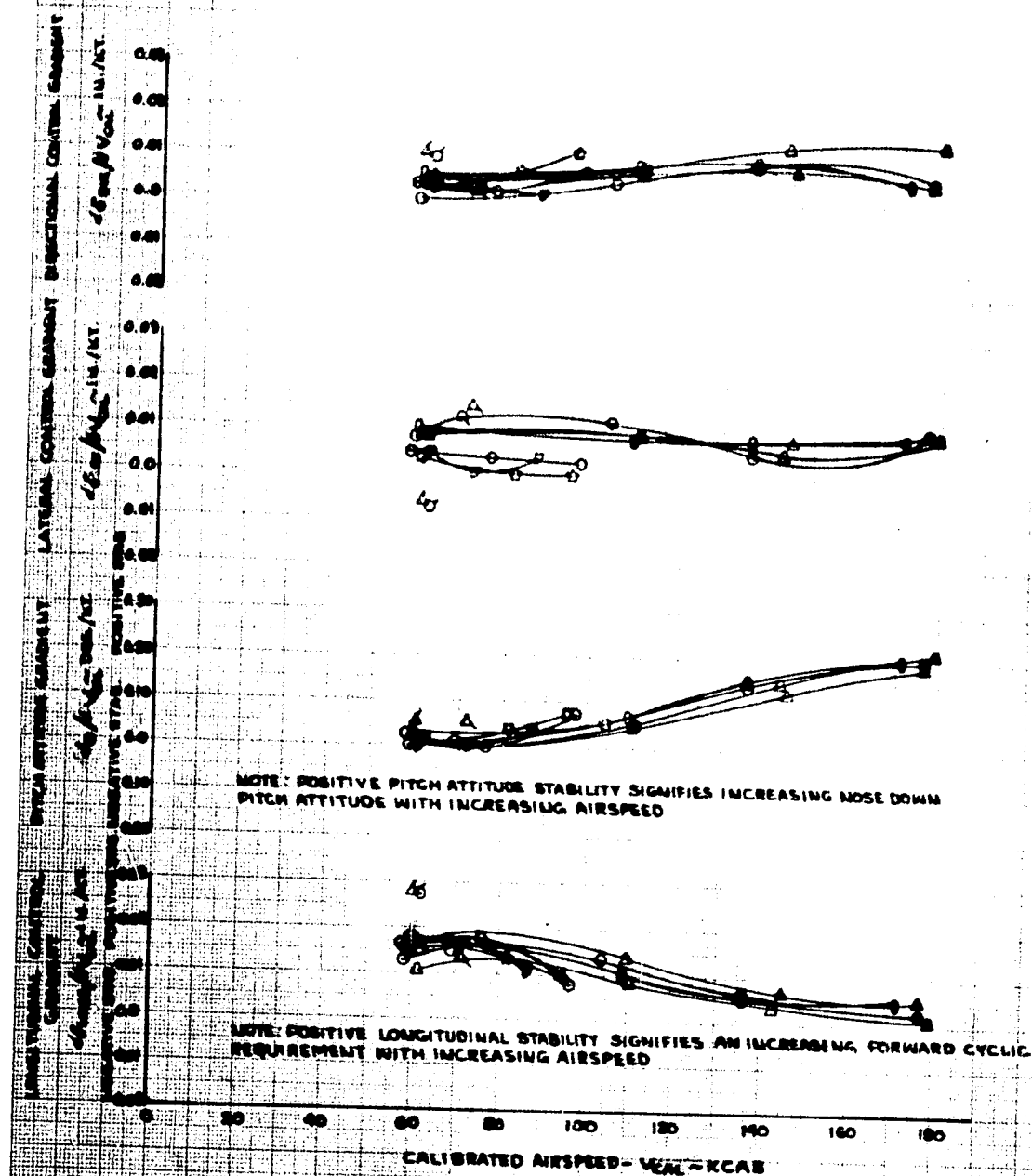


FIGURE No. 51
SUMMARY OF STATIC LONGITUDINAL COLLECTIVE FUEL STABILITY
AN-10

SYM	ANG. ALT. deg. ~ 10	ANG. ALT. deg. ~ 15	ANG. ALT. deg. ~ 20	SPD. THROTTLE deg. ~ 15	SPD. THROTTLE deg. ~ 20	SPD. THROTTLE deg. ~ 25
0	0.000	0.000	199.7 (40)	322.0	0.000000	CLEAN
4	0.150	0.100	321.2 (40)	322.5	0.000017	CLEAN - THROTTLE

1. POINTS DERIVED FROM FIGURES 20 THROUGH 22, 24 AND 25, APPENDIX XX

2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
 3. CROSSED SYMBOLS DENOTE CLIMB

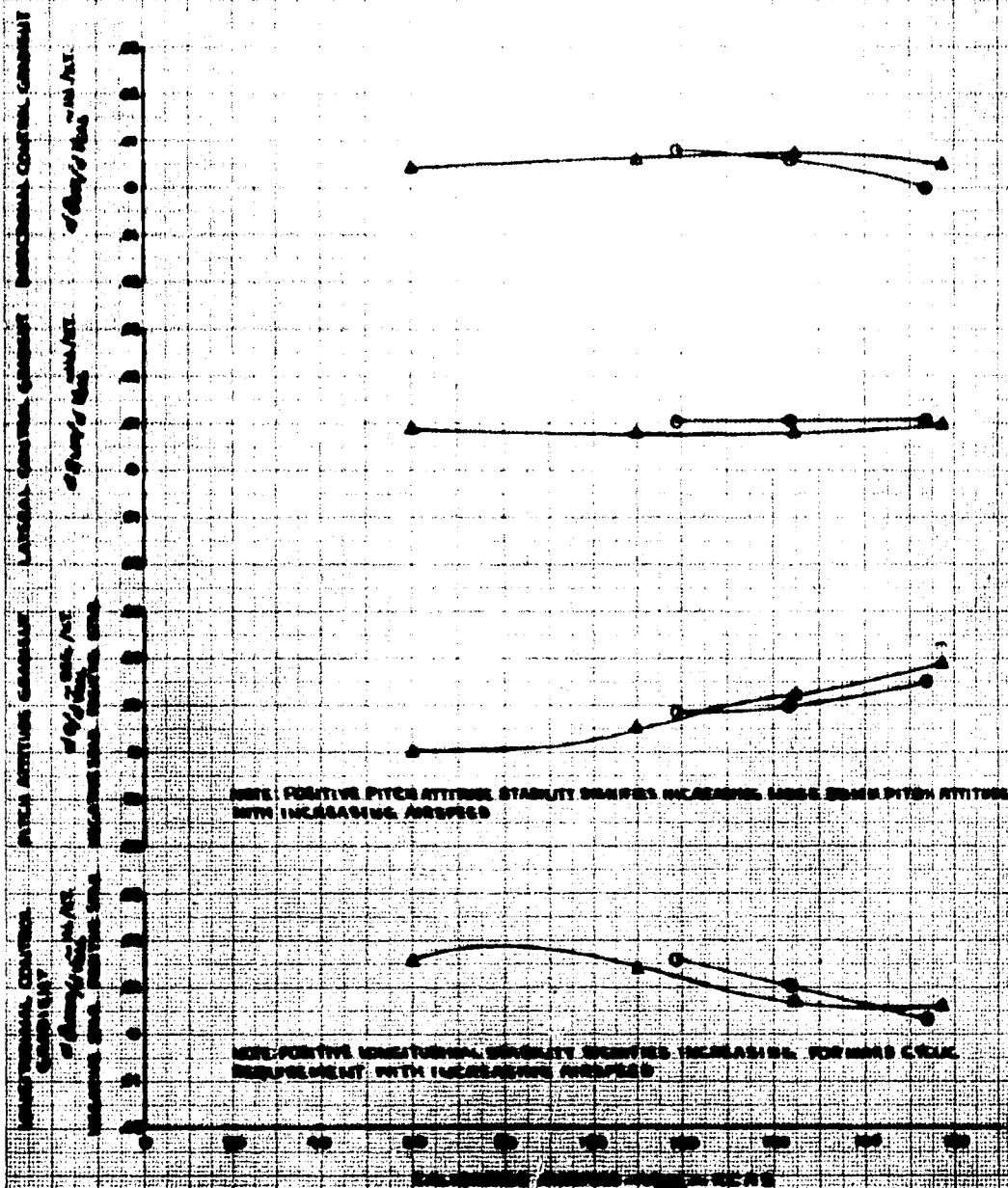


FIGURE No. 32
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AN-10 USAF 718698
CLEAN CONFIGURATION

SYM	AVG ALT ~ FT	AVG G.M. ~ LB	AVG LONG. C.G. ~ IN.	WING AREA	FLY COND	THRUST COEFF. ~ C_T
0	4180	7440	140.4 (PM)	284.0	LEVEL FLT.	0.004888
	5960	7820	140.3 (PM)	284.0	LEVEL FLT.	0.004873

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. 4M-20 CANN TURBINE INSTALLED (BRAND POSITION)

3. TOTAL CONTROL DISPLACEMENT

- LONGITUDINAL • 10.0 INCHES FROM FULL FORWARD
 - LATERAL • 9.0 INCHES FROM FULL LEFT
 - DIRECTIONAL • 8.97 INCHES FROM FULL LEFT
 - COLLECTIVE • 8.98 INCHES FROM FULL DOWN
4. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

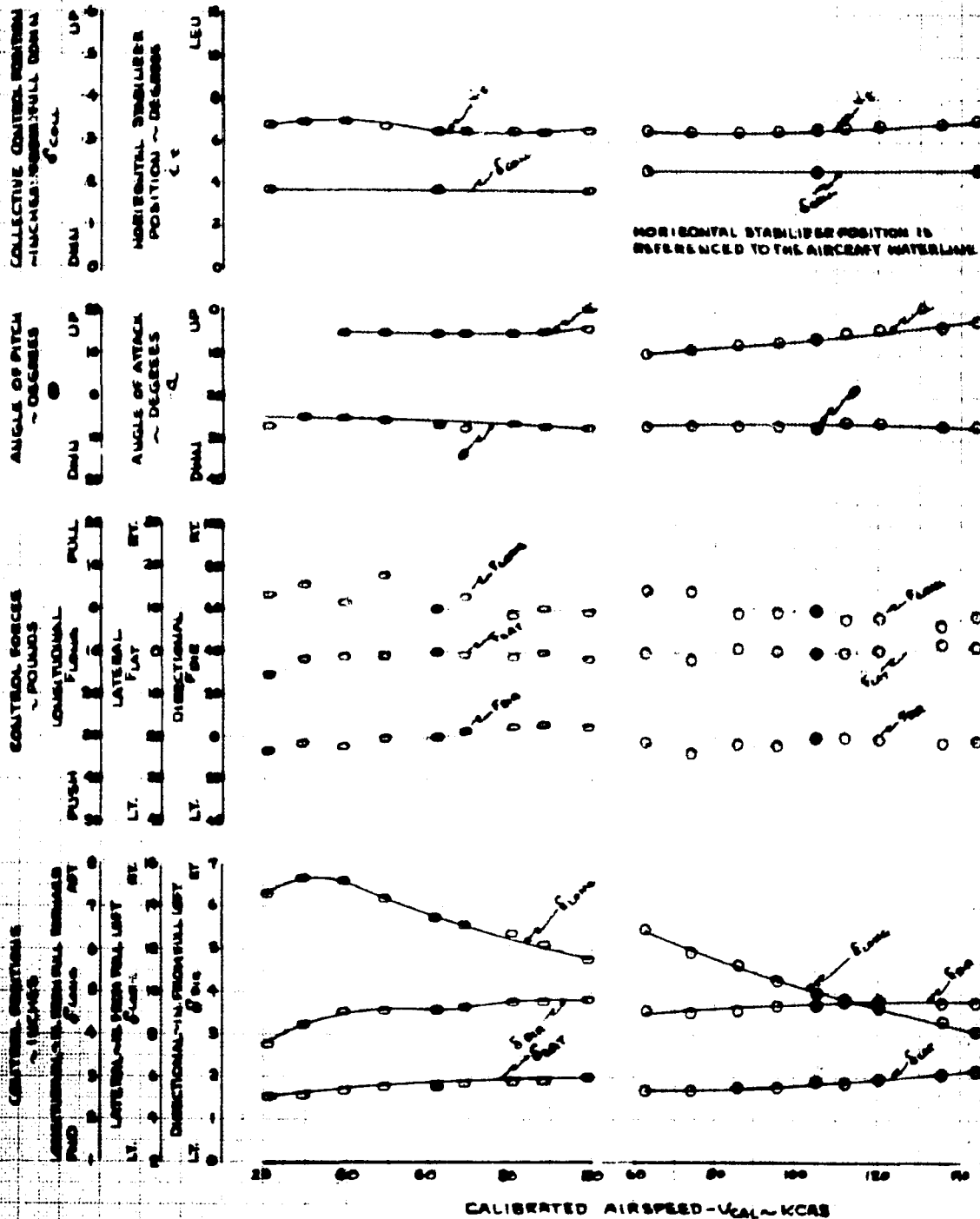
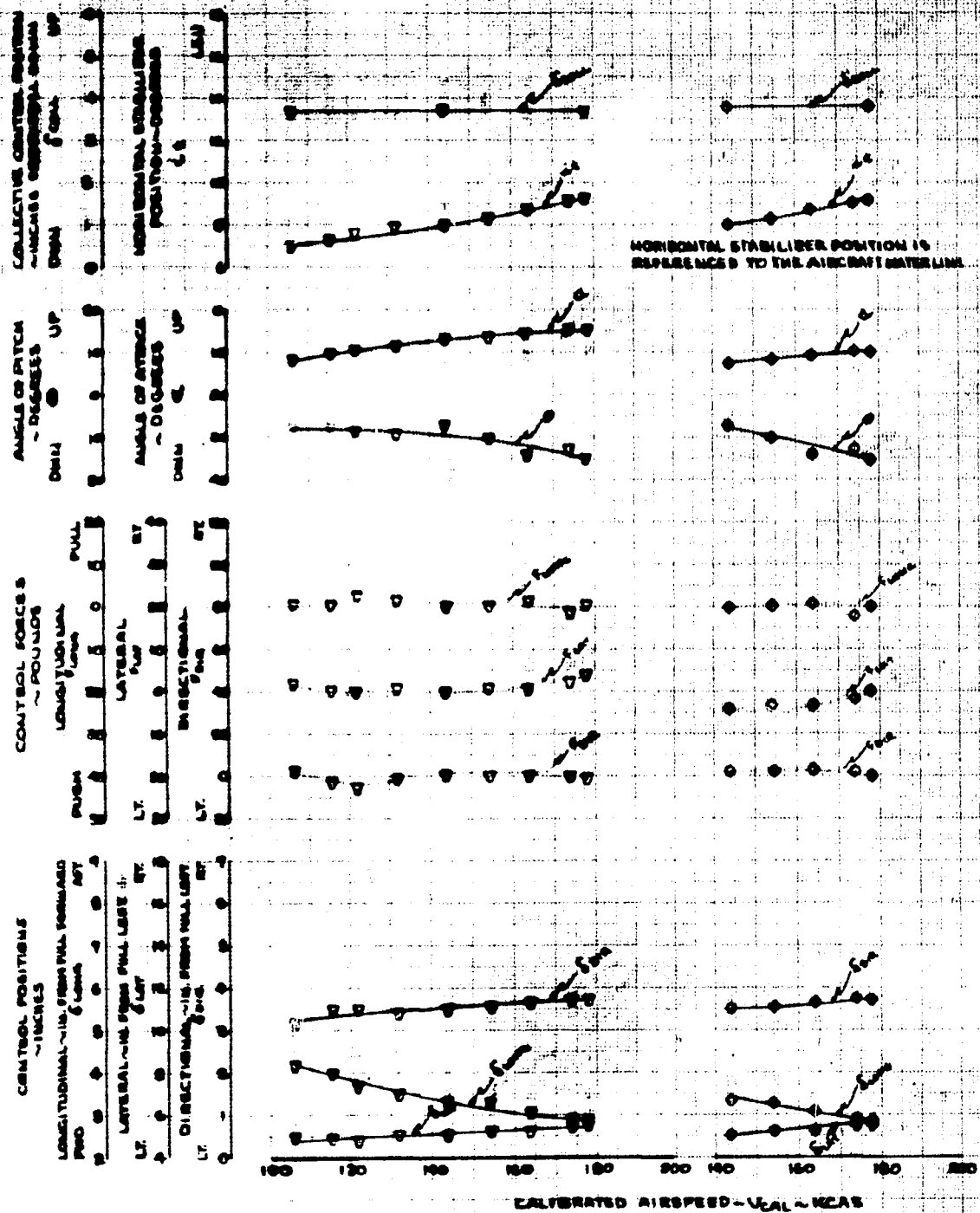


PLATE No. 25
STATIC LONGITUDINAL CHARACTERISTICS
AN-10 - USAF TYPES
STANDARD CONDITIONS

SYM.	AVE. ALT.	AVE. S.W.	AVE. LONG.	WIND	SLT. COND.	WEIGHT	TYPE
1	10,000	100	100	0	100	10,000	10,000
2	10,000	100	100	0	100	10,000	10,000

NOTES: 1. ALL DATA DERIVED FROM TESTS
 2. ALL DATA DERIVED FROM TESTS
 3. ALL DATA DERIVED FROM TESTS
 4. ALL DATA DERIVED FROM TESTS
 5. ALL DATA DERIVED FROM TESTS
 6. ALL DATA DERIVED FROM TESTS
 7. ALL DATA DERIVED FROM TESTS
 8. ALL DATA DERIVED FROM TESTS
 9. ALL DATA DERIVED FROM TESTS
 10. ALL DATA DERIVED FROM TESTS



AM-16 UNCLASSIFIED
CLEAR CONFIDENTIAL



Figure No. 25
Static Longitudinal Collective Fixed Stability
AN-10, 1000/1500
CARON Configuration

SEA	REL. ALT.	ANG. VEL.	ANG. POS.	STICK	FLY COND.	THRUST	COST.
0.0	1000	0.0	0.0	0.0	0.0	0.0	0.0
0.0	1500	0.0	0.0	0.0	0.0	0.0	0.0

NOTES:
 1. LOAD STICKS REMOVED FROM POINTS
 2. STICK STICKS REMOVED (STICKS POSITION)
 3. STICK STICKS REMOVED
 4. STICK STICKS REMOVED FROM FULL FORWARD
 5. STICK STICKS REMOVED FROM FULL LEFT
 6. STICK STICKS REMOVED FROM FULL DOWN
 7. STICK STICKS REMOVED FROM FULL RIGHT
 8. STICK STICKS REMOVED FROM FULL UP
 9. STICK STICKS REMOVED FROM FULL DOWN
 10. STICK STICKS REMOVED FROM FULL UP

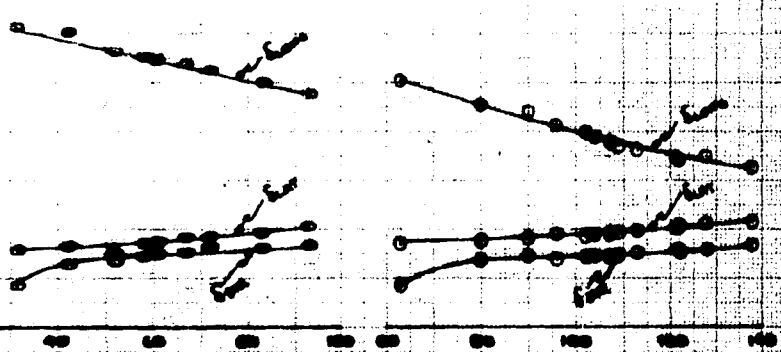
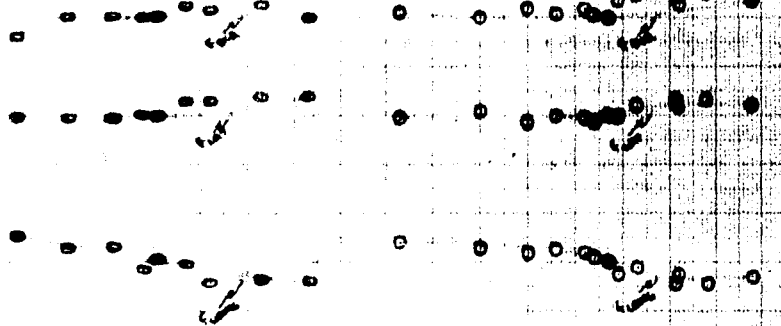
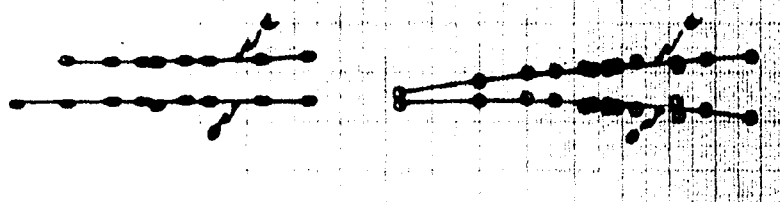
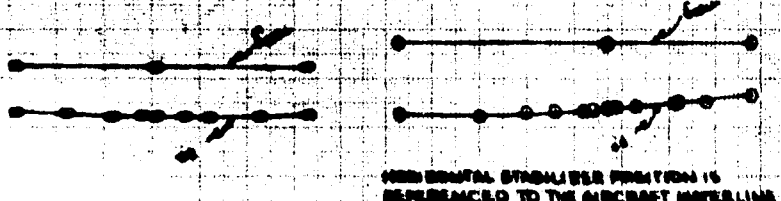
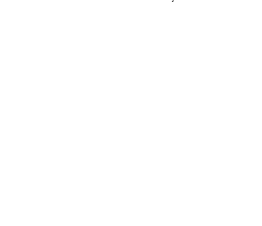
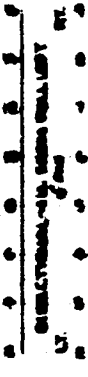
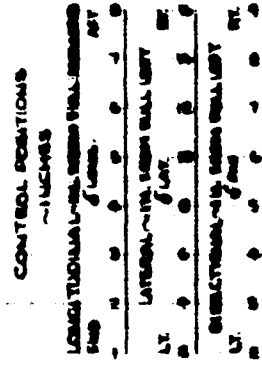
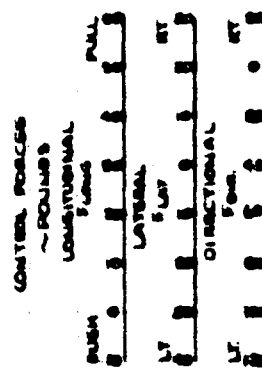
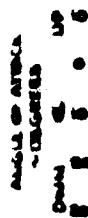
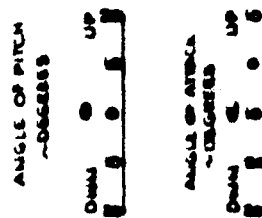
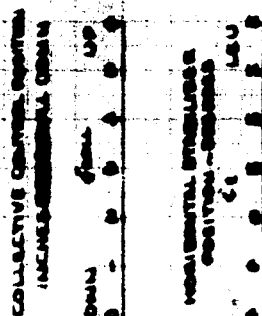


FIGURE No. 36
STATIC LONGITUDINAL COLLECTIVE FUEL STABILITY
AM-1G USAF/AFCS
CLEAN CONFIGURATION

WPA	AVG. ALT. M-10	AVG. G.M. - 10	AVG. LING. C.G. - 10	WPM	ALT. CORR.	THRUST CORR.
1	5700	6000	100.0 (700)	5000	LEVEL SET	0.00000
2	6700	7000	100.6 (700)	5000	DATA	0.00000

NOTES: 1. ZERO CORRECTIONS REMOTE TERM RESULTS

2. 5000 G.M. WEIGHT (REPRESENTATIVE POSITION)

3. ZERO CORRECTION DISPLACEMENT

LONGITUDINAL - 100 INCHES FROM FULL FORWARD

LATERAL - 100 INCHES FROM FULL LEFT

DIRECTIONAL - 50 INCHES FROM FULL LEFT

COLLECTIVE - 50 INCHES FROM FULL DOWN

0. CORRECTION FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

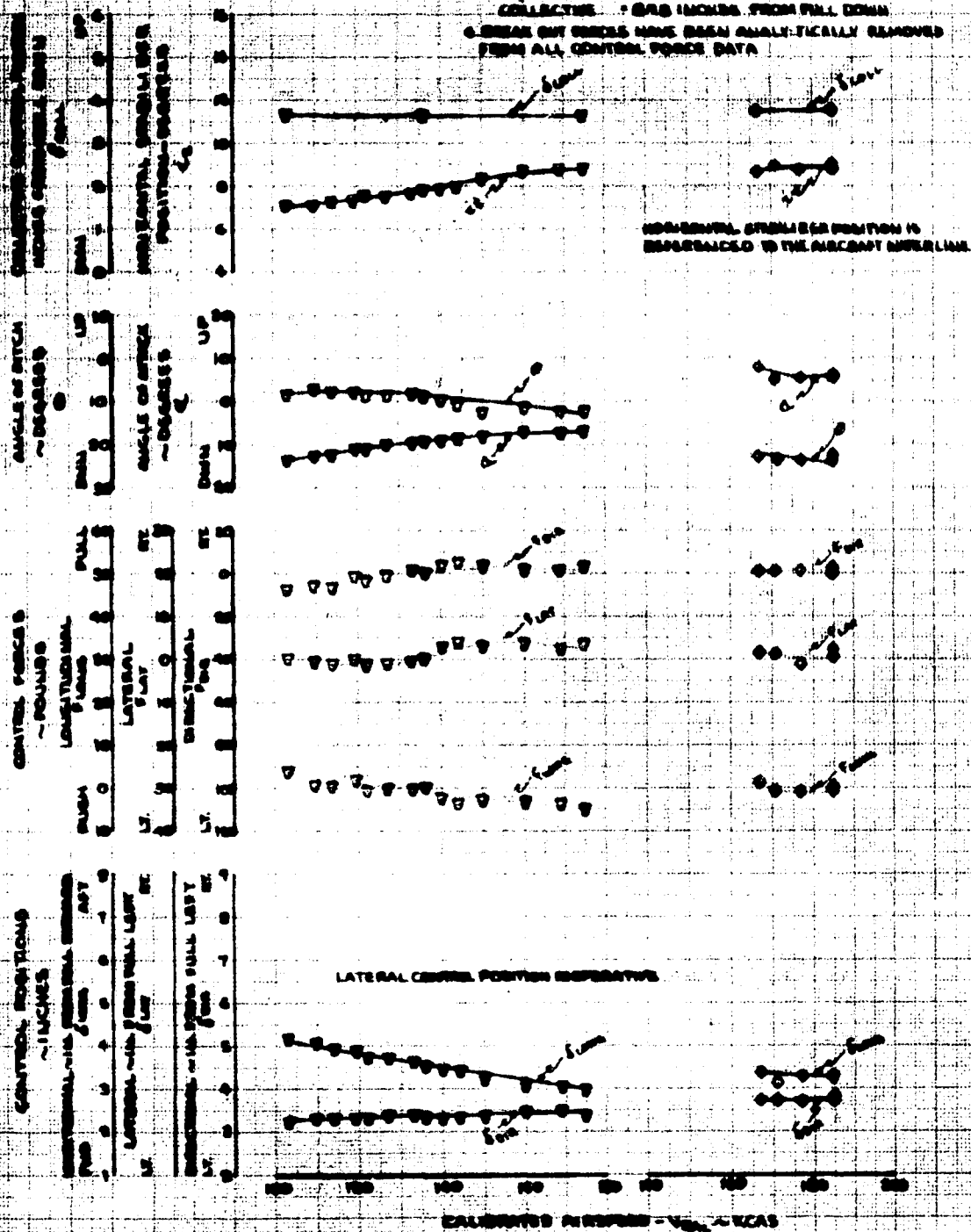


FIGURE NO 37
 STATIC LONGITUDINAL COLLECTIVE FLYING STABILITY
 AH-1G - UH-60/15000
 CLEAN CONFIGURATION

SYM	AVG. ALT ~ FT	AVG. G.W. ~ LB	AVG. LENG. CG ~ IN.	ROTOR RPM	PLT. COND.	THROTTLE POS.
A	6790	8100	101.1 (MID)	224.0	CLIMB	8000%
B	6400	8000	101.1 (MID)	224.0	ADVERSE	8000%

NOTES 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. 2X-10 CHIN TURBINE INSTALLED (TRIMMED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL INCHES FROM FULL FORWARD

LATERAL INCHES FROM FULL LEFT

DIRECTIONAL INCHES FROM FULL LEFT

COLLECTIVE INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

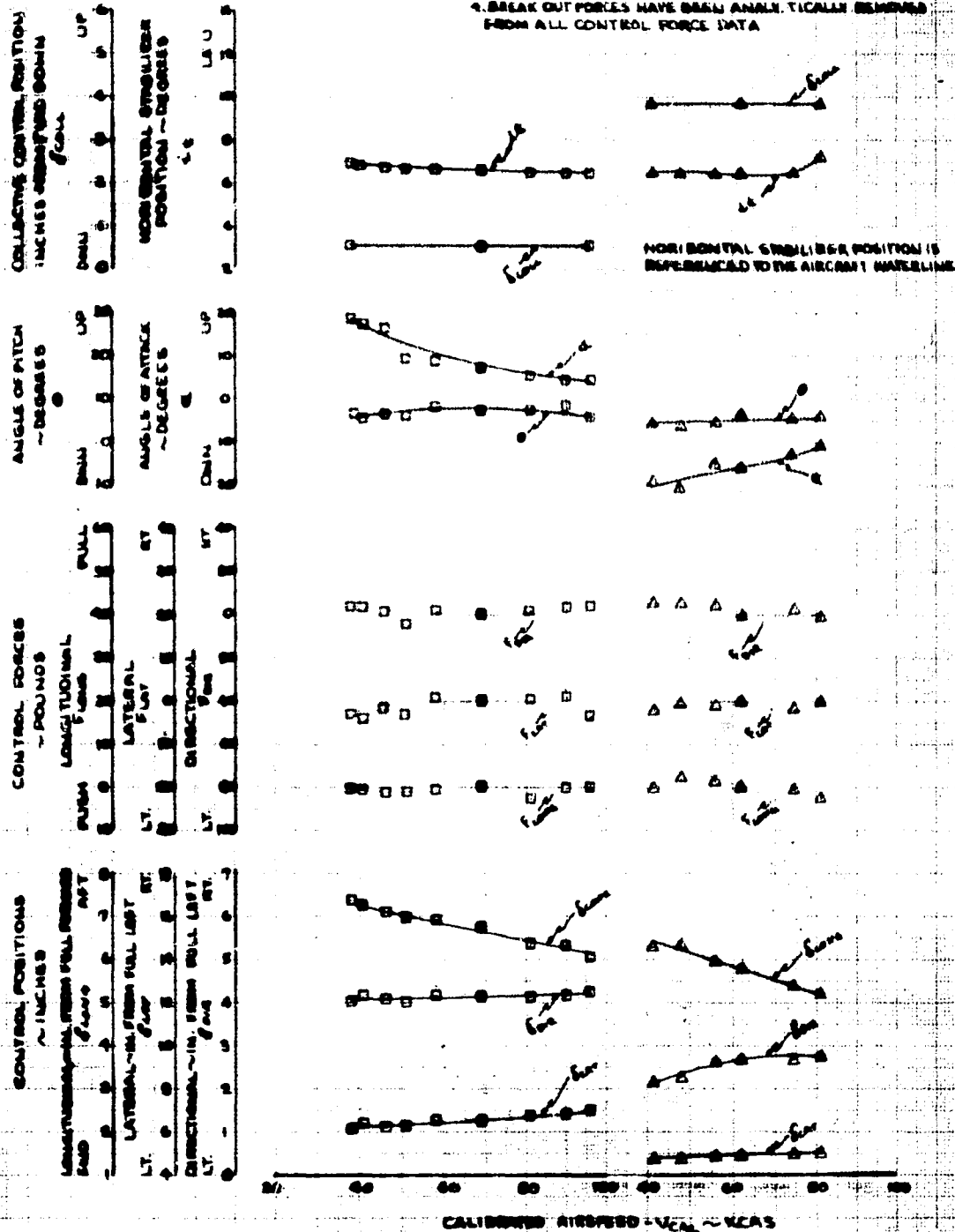


FIGURE NO. 58
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AN-10 USAF 15695
CLEAN CONFIGURATION

SYM	WING AREA SQ-FT	WING SPAN FT	WING CHORD FT	WING LOADING PSF	WING AREA SQ-FT	WING SPAN FT	WING CHORD FT	WING LOADING PSF	WING AREA SQ-FT	WING SPAN FT	WING CHORD FT	WING LOADING PSF	WING AREA SQ-FT	WING SPAN FT	WING CHORD FT	WING LOADING PSF	WING AREA SQ-FT	WING SPAN FT	WING CHORD FT	WING LOADING PSF
0	7700	77.00	77.00	77.00	7700	77.00	77.00	77.00	7700	77.00	77.00	77.00	7700	77.00	77.00	77.00	7700	77.00	77.00	77.00
0	4000	40.00	40.00	40.00	4000	40.00	40.00	40.00	4000	40.00	40.00	40.00	4000	40.00	40.00	40.00	4000	40.00	40.00	40.00

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. 24-28 CMH TURBINE INSTALLED (STOWED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL - 10.8 INCHES FROM FULL FORWARD
LATERAL - 9.9 INCHES FROM FULL LEFT
DIRECTIONAL - 8.9 INCHES FROM FULL LEFT
COLLECTIVE - 8.9 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

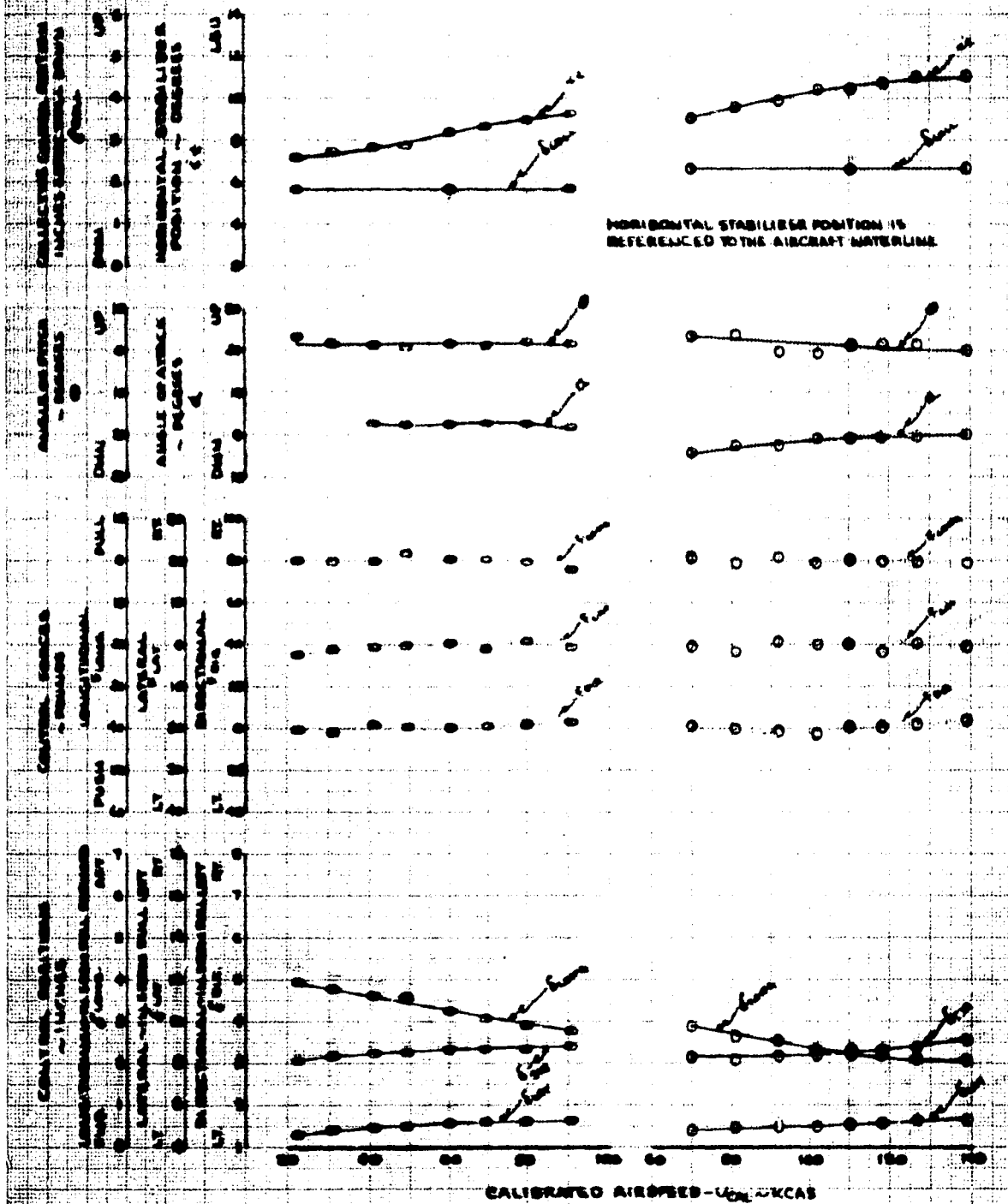


FIGURE NO. 34 STATIC LONGITUDINAL COLLECTIVE FIELD STABILITY AH-1G USAF/USMC CLEAN CONFIGURATION

SYM	AVE. ALT H ₀ - FT	AVE. L.A. - LB	AVE. LONG. C.G. - IN	ROTOR RPM	FLT COND. LEVEL - FT	THRUST COEFF - C _T
▽	9000	2000	200.000	2000	LEVEL	0.00000
◆	4000	2000	200.000	2000	1000	0.00000

NOTES: 1. SOLID SYMBOLS DENOTE TEST POINTS

2. IN-25 CON. THROST. INSTALLED

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - IN. FROM FULL DOWN

LATERAL - IN. FROM FULL LEFT

DIRECTIONAL - IN. FROM FULL LEFT

COLLECTIVE - IN. FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY DERIVED FROM ALL CONTROL FORCE DATA

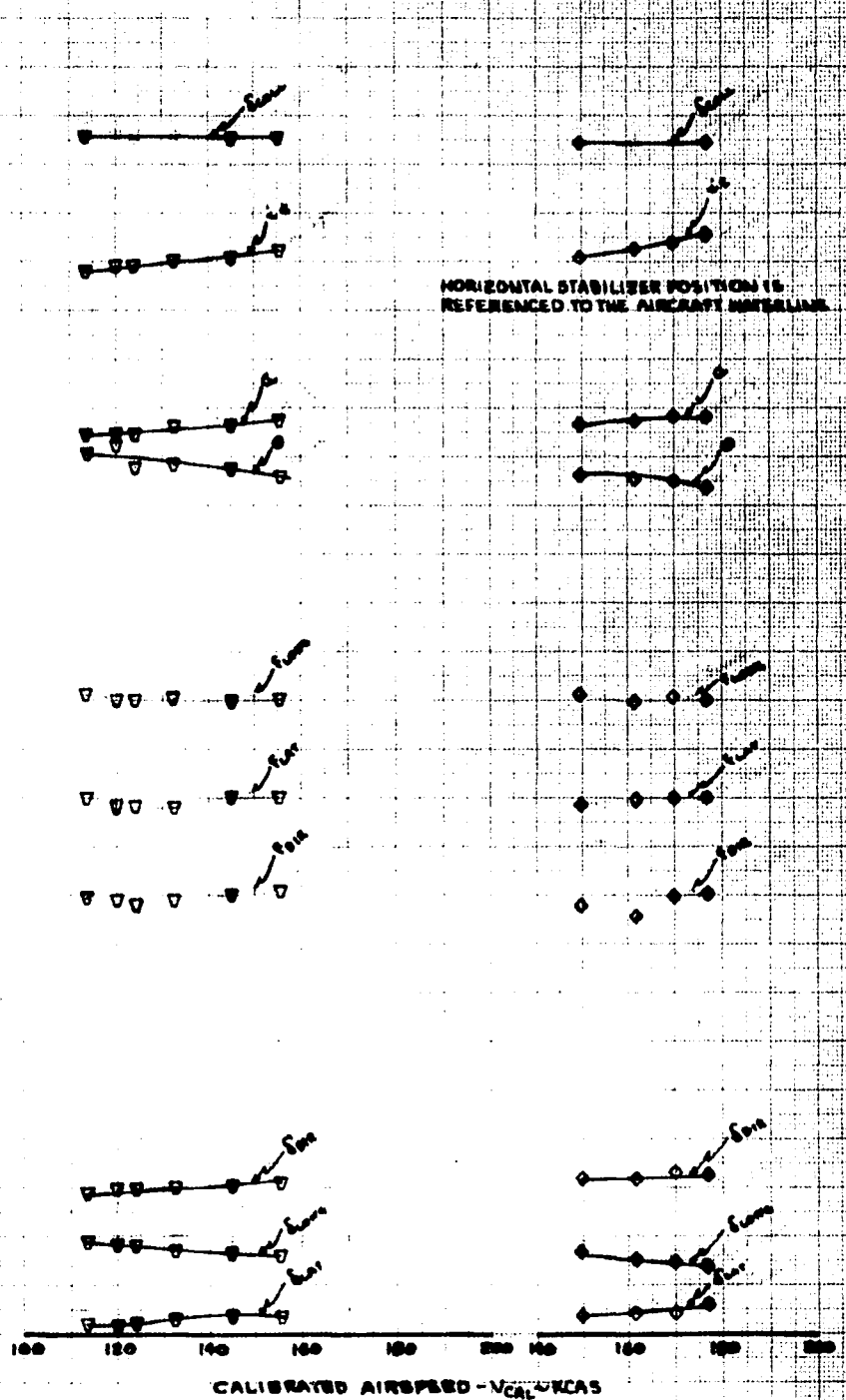
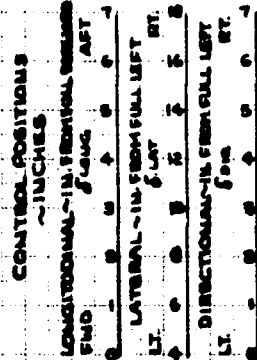
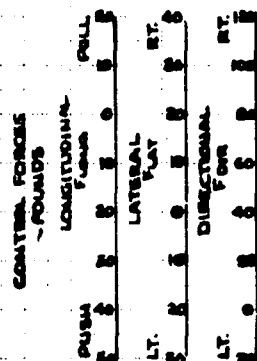
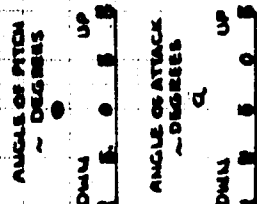
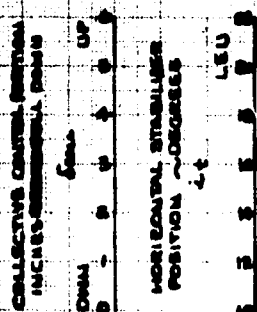


FIGURE NO. 40
STATIC LONGITUDINAL COLLECTIVE FIRED STABILITY

AN-10 SCAMPIORE
CLEAN CONFIGURATION

SYM. AIR. ALT. AIR. S.M. AIR. LONG. REVER. FLT. COND. THRUST COEFF.
M₀ ~ 0.75 10000 10000 10000 10000 10000 10000
1100 1100 1100 1100 1100 1100 1100
1100 1100 1100 1100 1100 1100 1100
NOTES: 1. SOLID SYMBOLS DENOTE TEST POINTS
2. 24-28 CM THRUST INSTALLED (BOMED POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL: 10.5 INCHES FROM FULL FORWARD
LATERAL: 4.92 INCHES FROM FULL LEFT
DIRECTIONAL: 5.82 INCHES FROM FULL LEFT
COLLECTIVE: 4.89 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY DERIVED
FROM ALL CONTROL FORCE DATA

COLLECTIVE CONTROL POSITION
INCHES FROM FULL DOWN
DOWN UP
0 1 2 3 4 5 6 7 8 9 10

ANGLE OF PITCH
~ DEGREES
DOWN UP
0 1 2 3 4 5 6 7 8 9 10

CONTROL FORCES
~ POUNDS
PUSH PULL
0 1 2 3 4 5 6 7 8 9 10

LONGITUDINAL
PUSH PULL
0 1 2 3 4 5 6 7 8 9 10

LATERAL
LEFT RIGHT
0 1 2 3 4 5 6 7 8 9 10

DIRECTIONAL
LEFT RIGHT
0 1 2 3 4 5 6 7 8 9 10

CONTROL POSITIONS
~ INCHES
LONGITUDINAL: 10.5 INCHES FROM FULL FORWARD
LATERAL: 4.92 INCHES FROM FULL LEFT
DIRECTIONAL: 5.82 INCHES FROM FULL LEFT
LEFT RIGHT
0 1 2 3 4 5 6 7 8 9 10

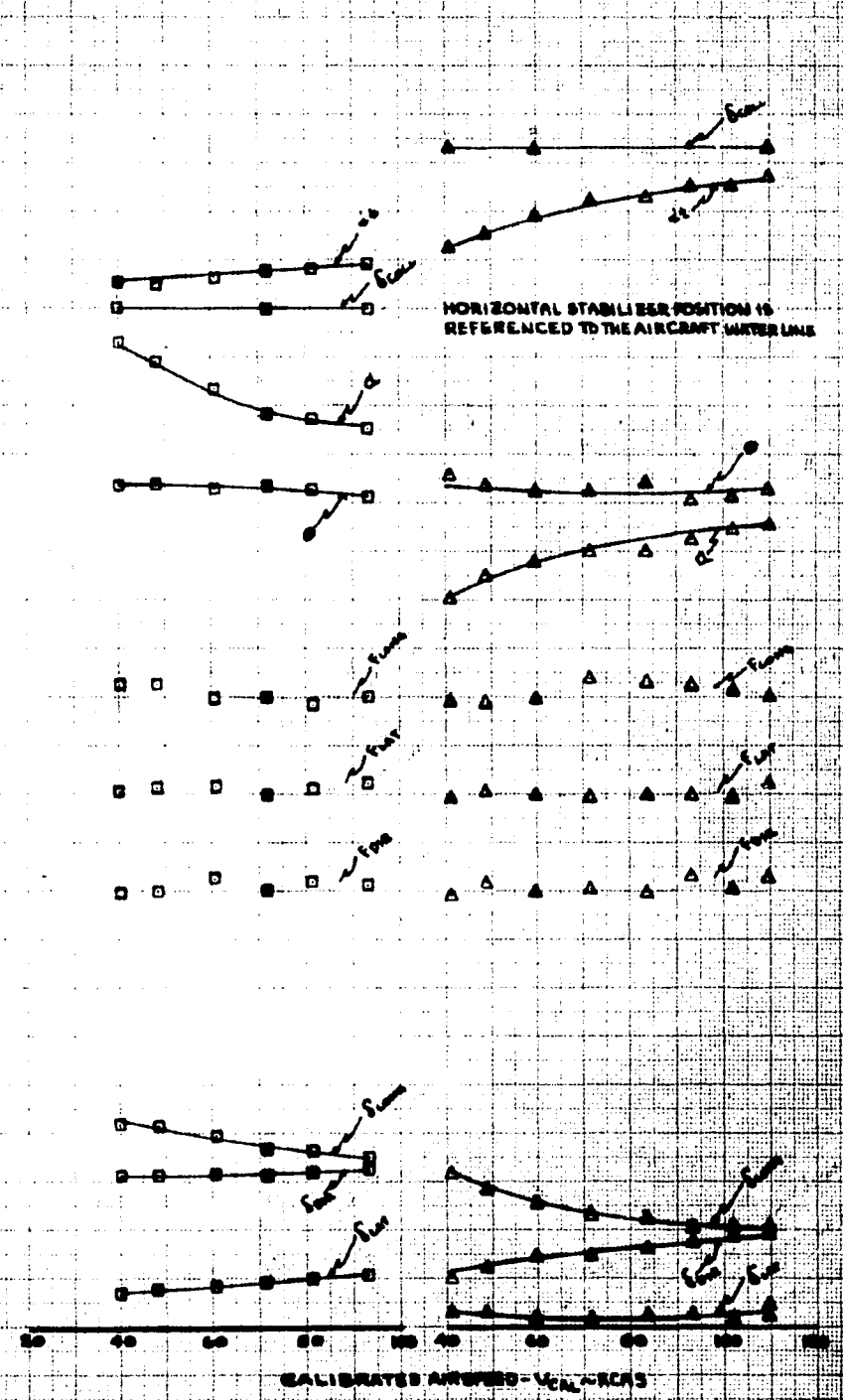


FIGURE No. 41
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USAMT 15678
CLEAN CONFIGURATION

SYM	AVG. ALT. H ₀ - FT	AVG. S.M. A ₀ - LB	AVG. LONG. C _D - 10	ROTOR RPM	FLT COND THRUST COEFF. ~ C _T
○	15000	8000	261.0 (AP)	324.0	LEVEL FLT. 0.006565
○	15000	8400	261.1 (AP)	323.0	LEVEL FLT. 0.006572

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. 1/4 IN. - 25 CM. TRIM INSTALLED (STOWED POSITION)

3. TOTAL CENTER DISPLACEMENT

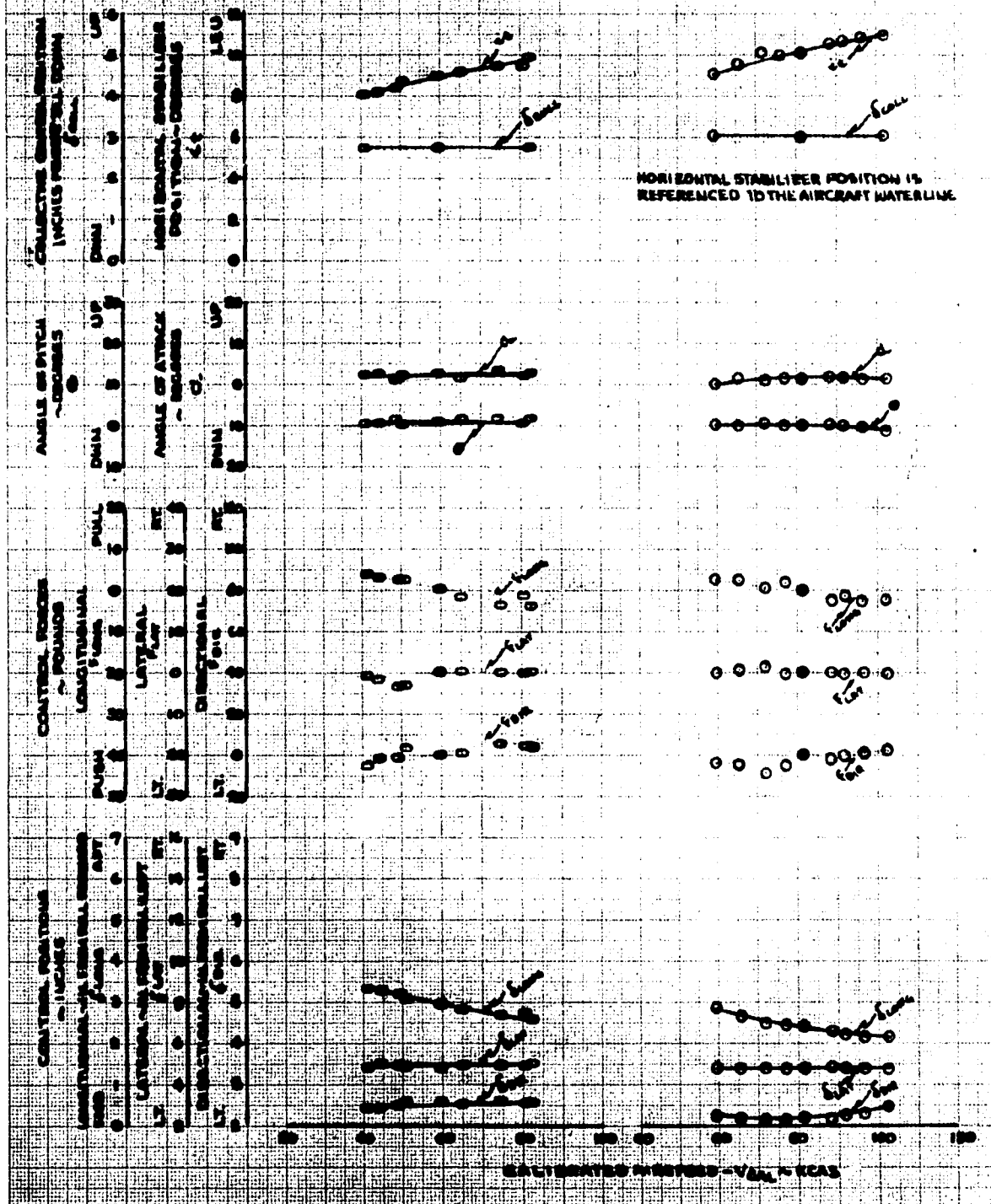
LONGITUDINAL - 1.00 INCHES FROM FULL FORWARD

LATERAL - 1.00 INCHES FROM FULL LEFT

DIRECTIONAL - 5.0 INCHES FROM FULL LEFT

COLLECTIVE - 0.0 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



1960-1961

...the ...

1. **المادة 1:** تُعقد هذه الانتخابات العامة لاختيار أعضاء المجلس التشريعي في جمهورية مصر العربية.

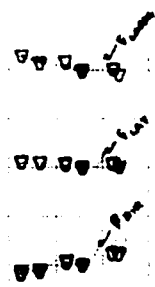
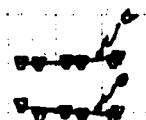
[illegible]

4. CONDUCT SURVEYS AND DEMOGRAPHICALLY BASED
RESEARCH ON ALL UNITED STATES DATA

2019



HORIZONTAL STRUTTER POSITION IS
REFERENCE D TO THE AIRCRAFT CENTERLINE



CALIBRATED AIRSPEED - VMC - KIAS

[illegible]

SYS	ANG. ALT deg - IN	ANG. CLIM deg - IN	ANG. LONG deg - IN	REFR RPM	FLY. COND.	THRUST. COEFF. ~Ct
0	2500	0000	00000000	2000	LEVEL FLY.	0.000700
0	1150	0000	00000000	2000	LEVEL FLY.	0.004600

UNLESS I. SOLID SYMBOLS MEANS TRIM POINTS

LONGITUDINAL : 10 INCHES FROM FULL FORWARD
LATERAL : 9 INCHES FROM FULL LEFT

BARECTIONAL • 57 INCHES FROM FULL LEFT
 COLLECTIVE • 57 INCHES FROM FULL DOWN

S-BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
FROM ALL CONTROL FORCE DATA

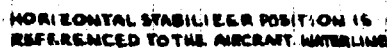


FIGURE No. 44
STATIC LONGITUDINAL COLLECTIVE PITCH STABILITY
AH-1G USAF/106498

SYM	AVG. ALT. ~ FT	AVG. SN. ~ LB	AVG. LONG. CG ~ IN.	ENGINE RPM	FLT COND.	THROTTLE COEFF ~ C _T
◇	4000	0100	201.0 (APT)	2500	LEVEL FLT	0.004715
●	4100	0100	201.0 (APT)	2500	DIVE	0.004422

NOTES: 1. SOLID CIRCLES DENOTE TRIM POINTS

2. 24-25 CONTROL INPUTS (SPIN POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 10.0 INCHES FROM FULL DOWN

LATERAL - 9.0 INCHES FROM FULL LEFT

DIRECTIONAL - 24.7 INCHES FROM FULL LEFT

COLLECTIVE - 8.95 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

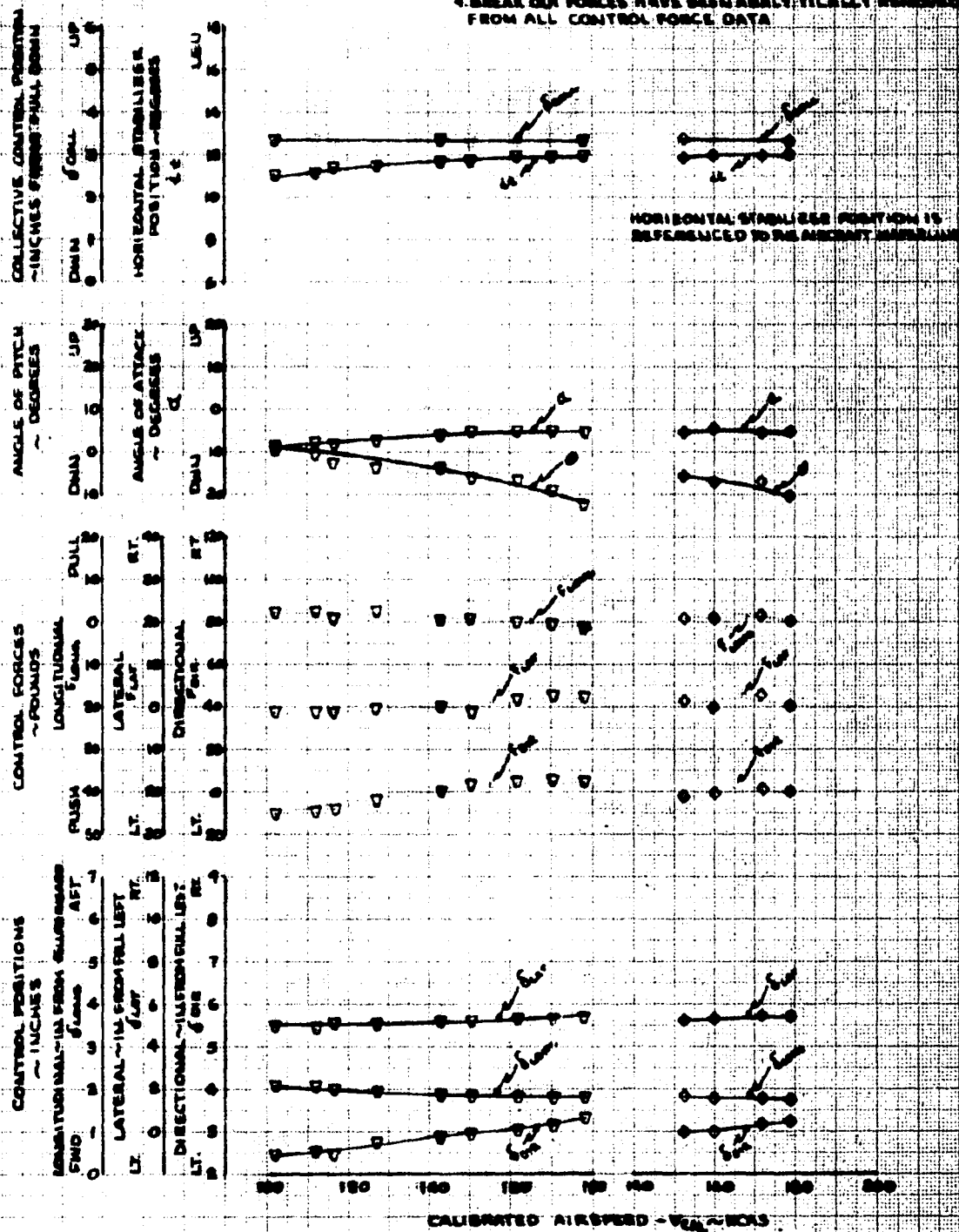


FIGURE NO. 45
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USAF 1969
OUTER ALTERNATE CONFIGURATION WITH BRACKET POSTAININGS REMOVED

SYM	AVG. ALT. H ₀ - FT	AVG. G.M. - LB	AVG. LONG. S.G. - IN.	ROTOR RPM	FLT. COND.	THRUST - CT
0	8000	8700	8000 (8000)	8000	LEVEL FLT. 0.00000	0.00000
0	8000	8700	8000 (8000)	8000	LEVEL FLT. 0.00000	0.00000

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
2. 14-20 CM IN TURBO INSTALLS (DOWNS POSITION)
3. TOTAL CONTROL DISPLACEMENT
LONGITUDINAL - 10.00 INCHES FROM FULL FORWARD
LATERAL - 0.80 INCHES FROM FULL LEFT
DIRECTIONAL - 0.80 INCHES FROM FULL LEFT
COLLECTIVE - 0.80 INCHES FROM FULL DOWN
4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

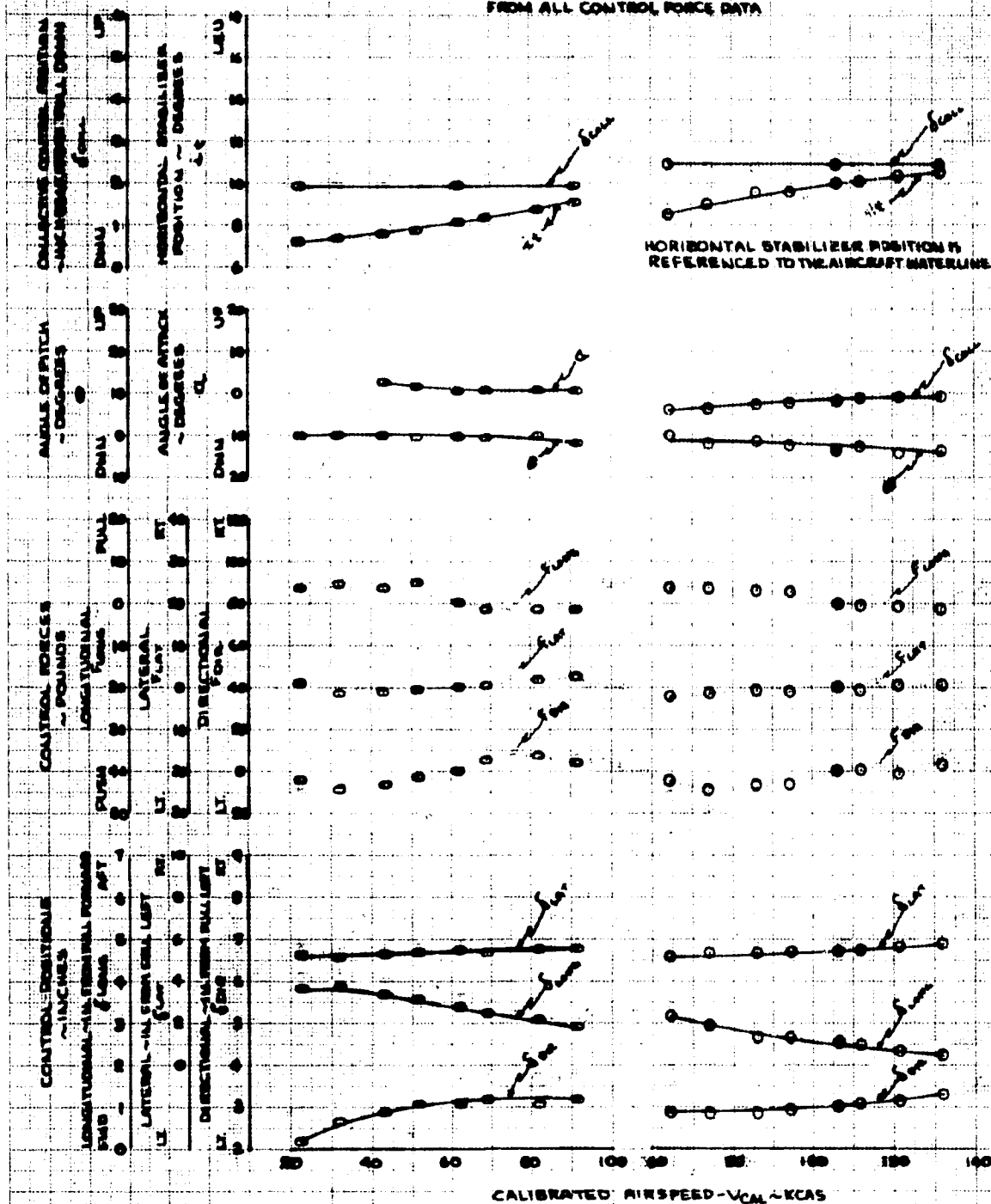


FIGURE NO. 46
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AN-12 USA PATENT
OUT OF ALTERNATE CONFIGURATIONS WITH SOCIETY AND PAIRINGS REMOVED

SYM	AVE. ALT. MO-FT	AVE. GM ~LB	AVE. LONG. C.G. ~IN.	RETR. SPM	FLY. COND.	THRUST COEFF. ~CT
1	5750	9050	2850 (AV)	5546	LEVEL FLY	0.00505
2	9170	9350	2850 (AV)	5510	DIVE	0.00575

NOTES: 1. SOLID SYMBOLS DENOTE TEST POINTS
 2. 2.5-35 CM TURRET INSTALLED (STRESS POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD
 LATERAL - 5.00 INCHES FROM FULL LEFT
 DIRECTIONAL - 5.75 INCHES FROM FULL LEFT
 COLLECTIVE - 5.00 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY DERIVED FROM ALL CONTROL FORCE DATA

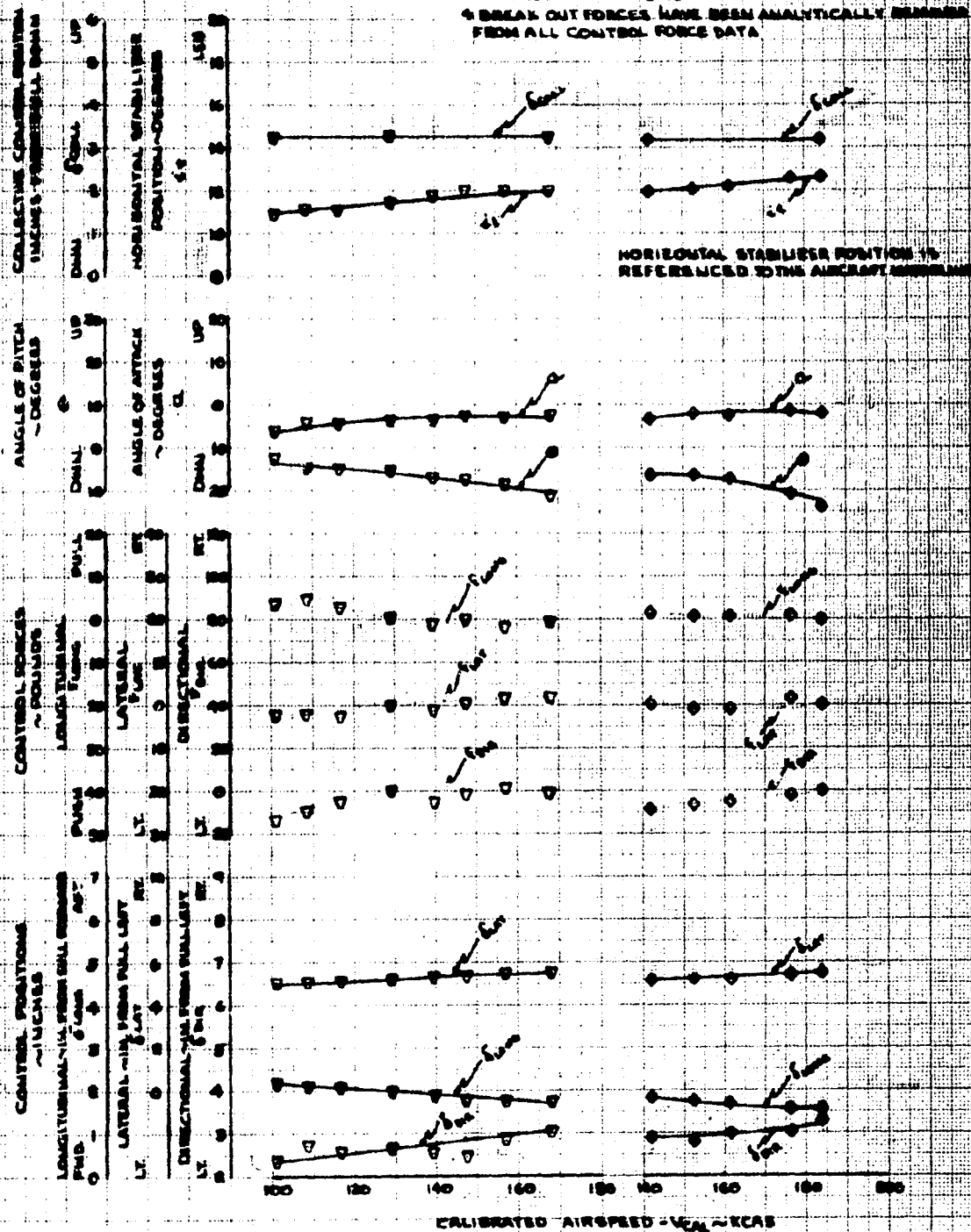


FIGURE No. 47 STATIC LONGITUDINAL COLLECTIVE FIELD STABILITY AN-18 USAF 715628

OUTER ALTERNATE CONFIGURATION WITH RECENT POD FAIRINGS REMOVED

SEA	AVG. ALT. ~1000 FT	AVG. S.W. ~1.5	AVG. LONG. C.G. ~100	WING AREA	FLY COND.	THRUST COEFF ~0.006
0	10000	0.500	2000 (APT)	2000	LEVEL FLT.	0.006400
0	10000	0.500	2000 (APT)	2000	LEVEL FLT.	0.006500

NOTES: 1. SOLID CIRCLES INDICATE TEST POINTS

2. 50-20 CMH RECENT INSTALLED (STANDARD POSITION)

3. TOTAL CONTROL DISPLACEMENT

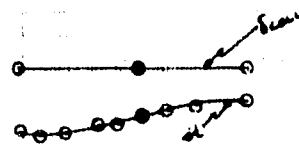
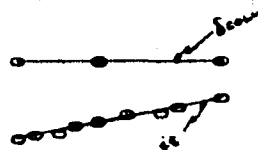
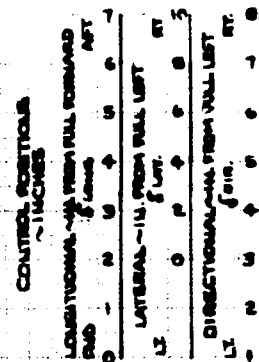
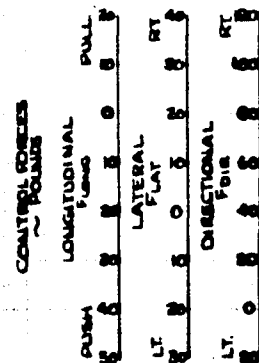
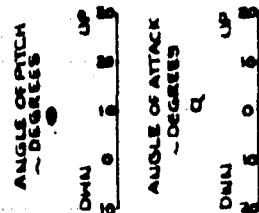
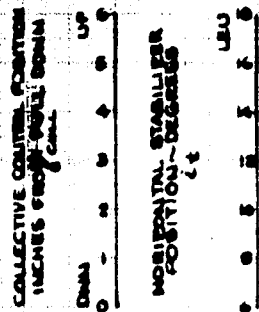
LONGITUDINAL = 100 INCHES FROM FULL FORWARD

LATERAL = 100 INCHES FROM FULL LEFT

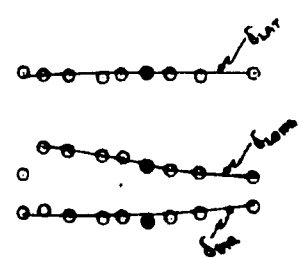
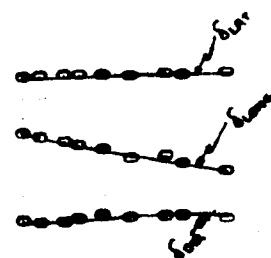
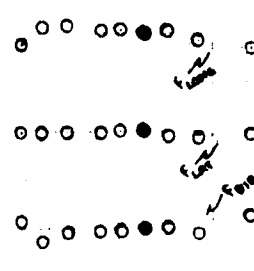
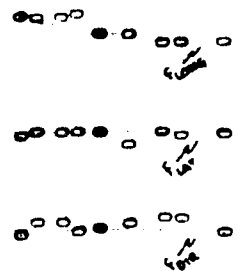
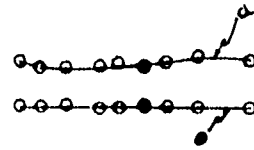
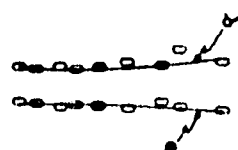
DIRECTIONAL = 100 INCHES FROM FULL LEFT

COLLECTIVE = 0.90 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE



CALIBRATED AIRSPEED - V_{CAL} - KCAS

[illegible]

1. NAME OF THE PARTY

E-ONE-20 CANAL TIGHT BATTERY AND OVERBOARD SYSTEMS

2. INITIAL CONTACT INFORMATION

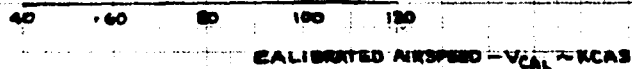
CONFIDENTIAL - SECURITY INFORMATION

LATERAL 2. 0.45 HOURS FROM WALL LEFT

CONFIDENTIAL - SECURITY INFORMATION

COLLECTIVE • 20 MEMBERS • 1 YEAR • \$1.00

4. BRAN CUT FORCES HAVE BEEN ANALYTICALLY DERIVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS
REFERENCED TO THE AIRCRAFT CENTERLINE

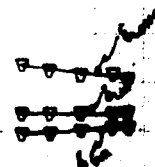
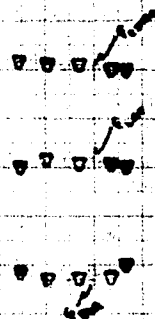
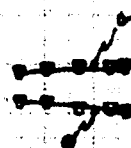


FIGURE No. 49
STATIC LONGITUDINAL COLLECTIVE PITCH STABILITY
AND USABILITY

HVV SCOUT CONFIGURATION WITH ROCKET FOR TRAINING REMOVED

SYM	AVE. ALT. ~ FT.	AVE. G.M. ~ LB.	AVE. LONG. C.G. ~ IN.	WING SQ. FT.	WING LOAD ~ LB./SQ. FT.	FLY. COND.	THRUST COEFF. ~ C _T
○	5000	1000	200.0 (WT)	250.0	4.00	LEV. ST.	0.0045
●	5000	1000	200.0 (WT)	250.0	4.00	LEV. ST.	0.0045

NOTES: 1. SOLID SYMBOLS INDICATE TEST POINTS

2. IN-25 CAN TURRET INSTALLED (DOWN POSITION)

3. TOTAL CONTROL DISPLACEMENT

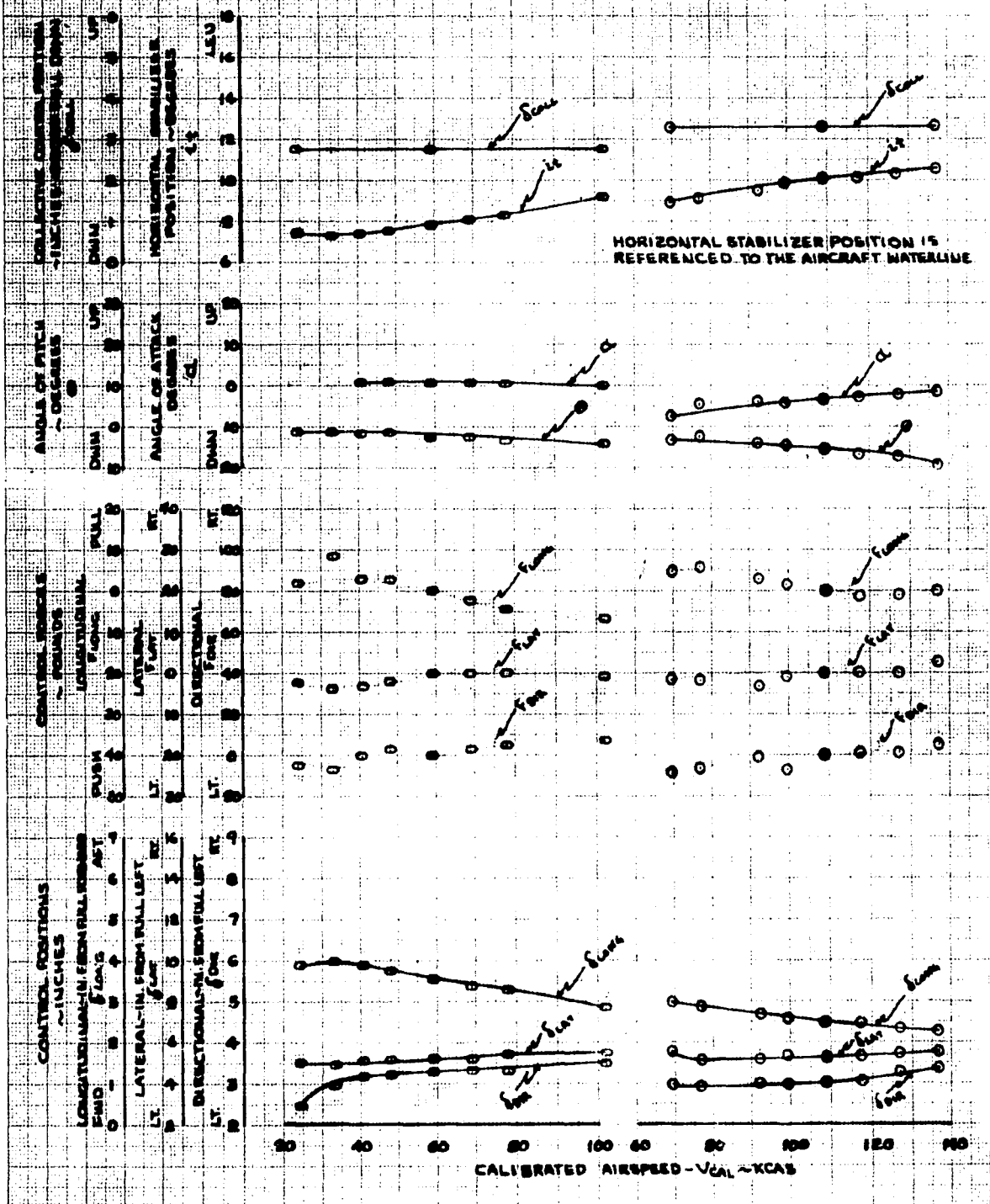
LONGITUDINAL: 10 INCHES FROM FULL FORWARD

LATERAL: 1.0 INCHES FROM FULL LEFT

DIRECTIONAL: 1.0 INCHES FROM FULL LEFT

COLLECTIVE: 1.0 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



AN-12 USAF 715695
HYV. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS.
2. IN-20 CHAM TURBIST INSTALLED (BOWED POSITION)
3. TOTAL CHAM TURBIST INSTALLED (BOWED POSITION)

LONGITUDINAL : 1.10 INCHES FROM FULL FORWARD
LATERAL : 5.90 INCHES FROM FULL LEFT
DIRECTIONAL : 8.97 INCHES FROM FULL LEFT
COLLECTIVE : 8.0 INCHES FROM FULL DOWN
BREAK OUT FORCES HAVE BEEN ANALYTICALLY DERIVED
FROM ALL CONTROL FORCE DATA

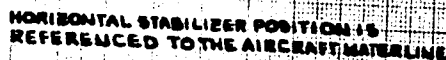


FIGURE No. 51
 STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AH-1G USAF 715695
 HVT. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ CT
0	7250	9670	2083 (AFT)	324.0	LEVEL FLT.	0.005595
0	6600	9140	2008 (AFT)	324.0	LEVEL FLT.	0.005569

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. XM-28 CHIN TURST INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 100.5 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL FORWARD

DIRECTIONAL = 5.97 INCHES FROM FULL FORWARD

COLLECTIVE = 8.48 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

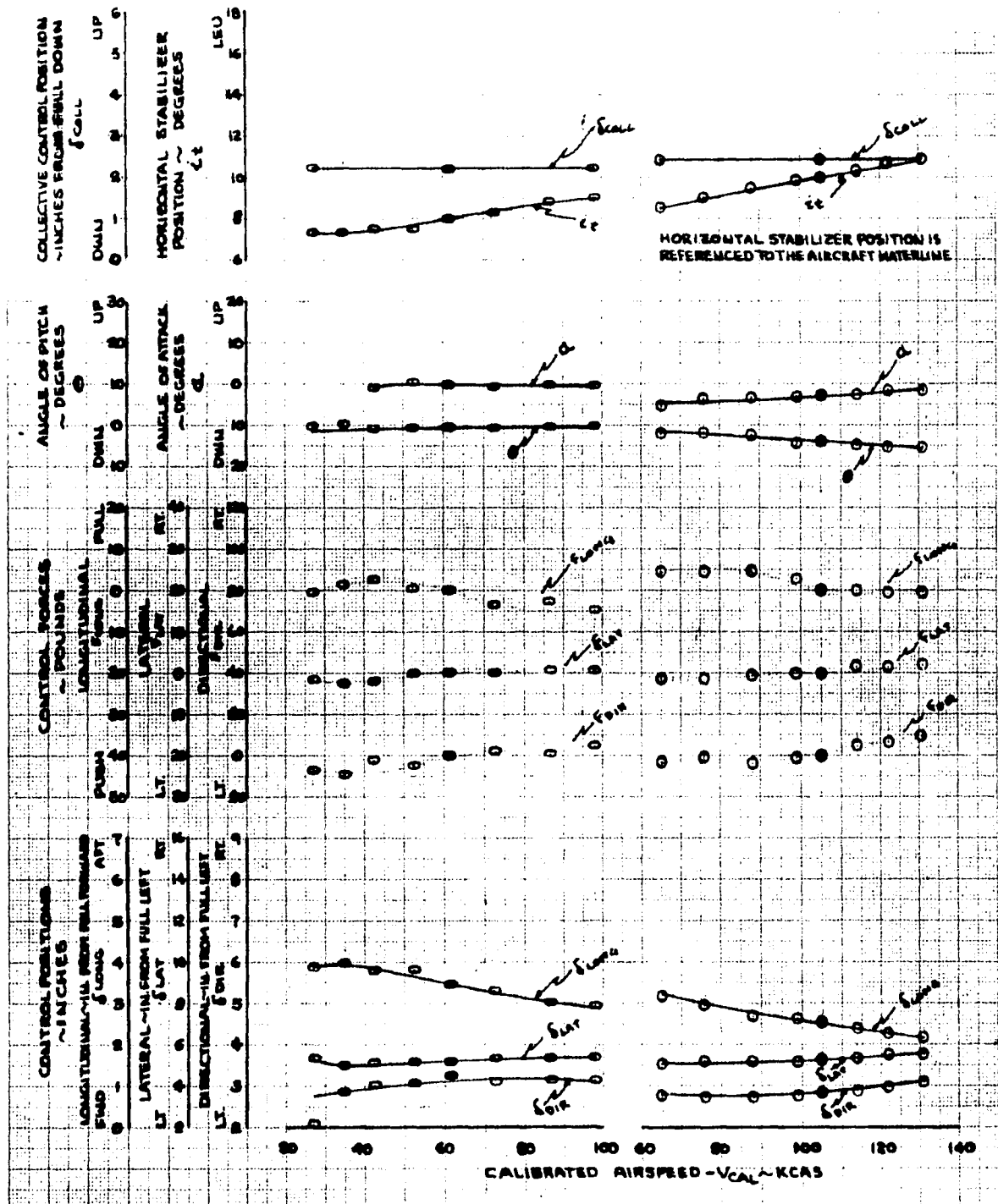


FIGURE NO. 52
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
AH-1G USAM718698
HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. ~ FT.	AVG. G.M. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C _T
▽	4950	4950	2008.2 (ATT)	324.0	LEVEL FLT.	0.00558
●	5540	4950	2008.2 (ATT)	324.0	DIVE	0.005183

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. 1.5M-25 CANN TURRET INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.05 INCHES FROM FULL FORWARD

LATERAL = 9.05 INCHES FROM FULL LEFT

DIRECTIONAL = 5.45 INCHES FROM FULL LEFT

COLLECTIVE = 8.75 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY DERIVED FROM ALL CONTROL FORCE DATA

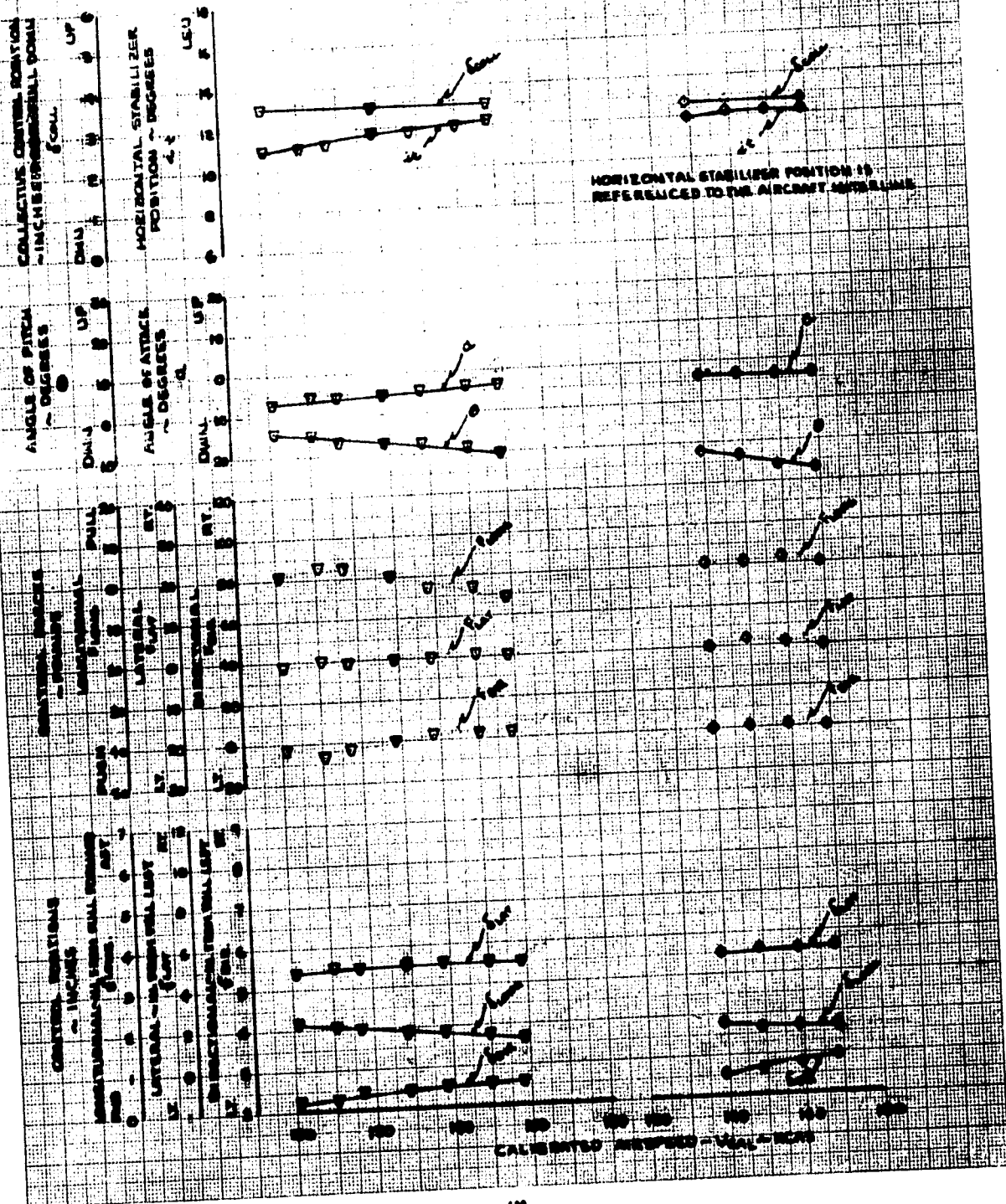


FIGURE No. 58
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AX-18 USAF TISSER
 HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H ₀ - FT.	AVG. S.W. ~ LB.	AVG. LONG. C.G. ~ IN. (INT. STAB)	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C _T
●	6400	8800	1912.0 (IN)	325.0	LEVEL FLT.	0.004875
○	6100	8845	1912.0 (IN)	325.0	LEVEL FLT.	0.004468

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. 18-INCH THRUST (INSTALLED) (DOWNED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL = 10.0 INCHES FROM FULL FORWARD
 LATERAL = 9.9 INCHES FROM FULL LEFT
 DIRECTIONAL = 8.9 INCHES FROM FULL LEFT
 COLLECTIVE = 8.9 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY
 REMOVED FROM ALL CONTROL FORCE DATA

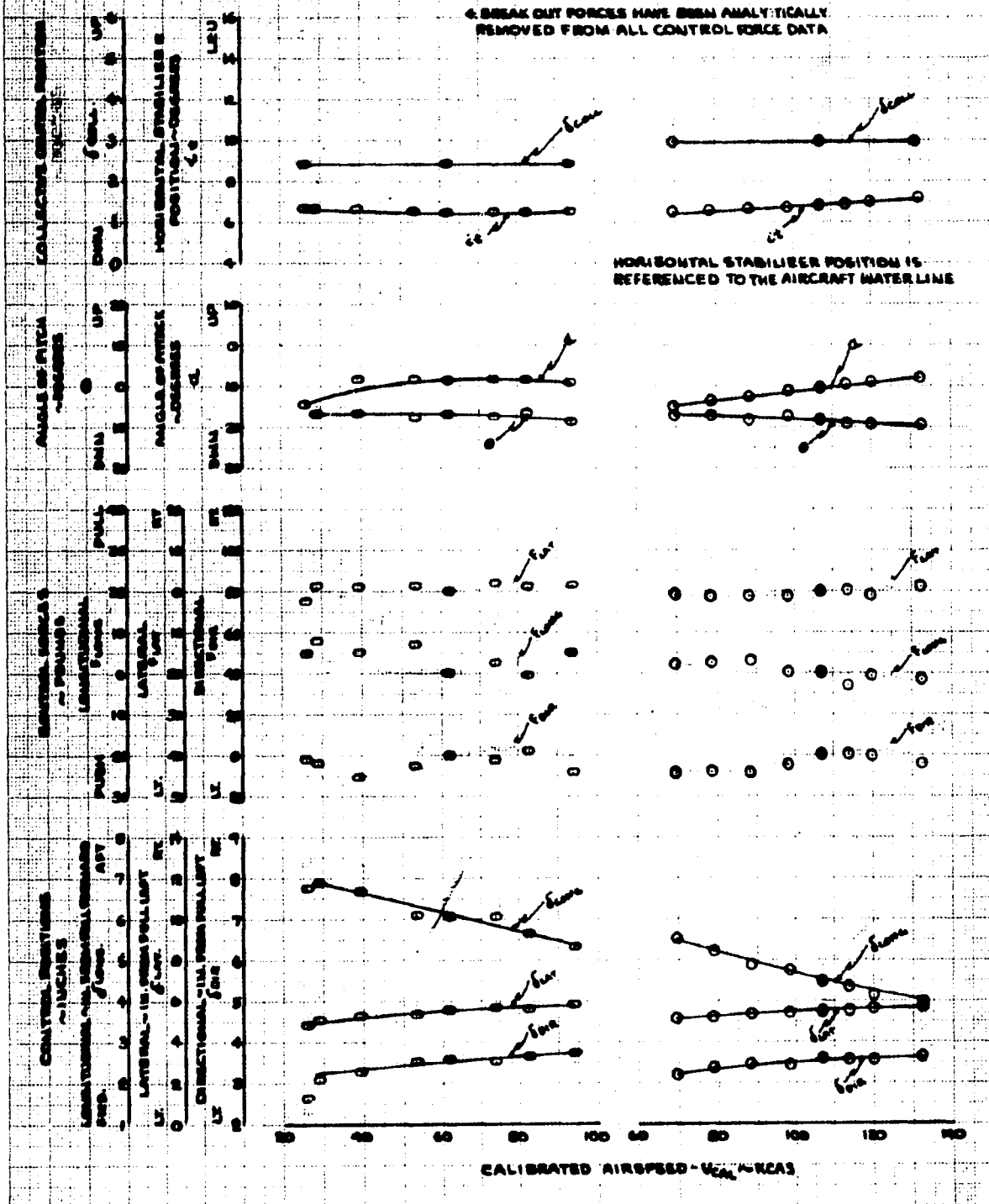
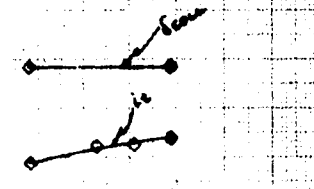
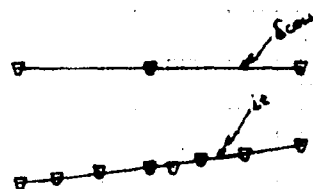
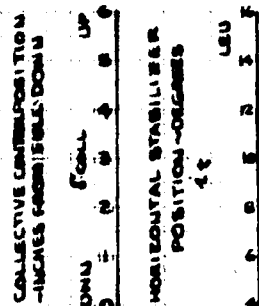


FIGURE NO. 54 STATIC LONGITUDINAL COLLECTIVE FUEL STABILITY AK-10 4244718698

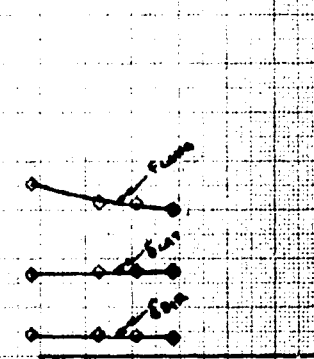
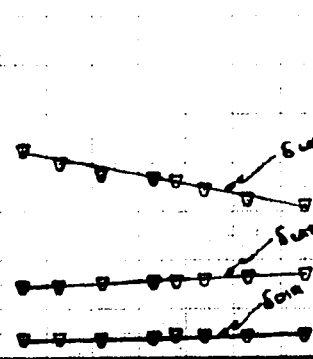
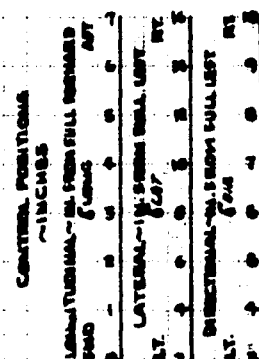
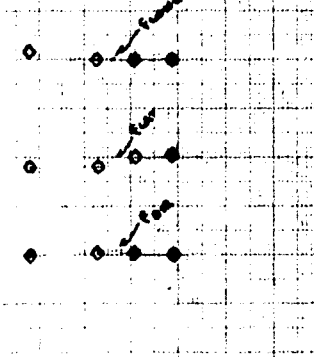
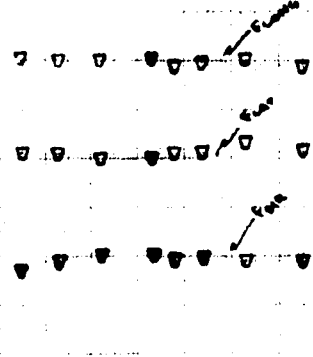
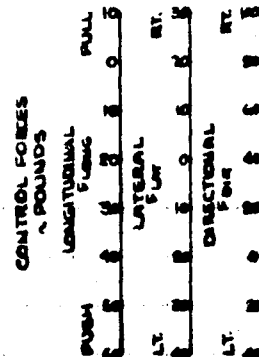
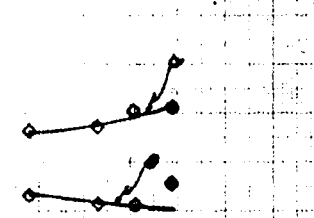
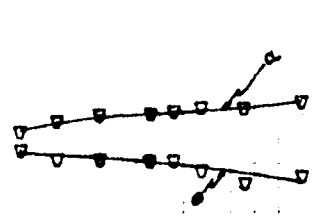
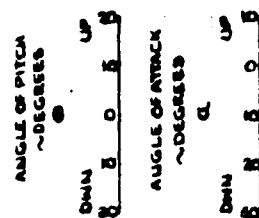
HVY. HOG CONFIGURATION WITH ROCKET FOD FAIRINGS REMOVED

SYM	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. L.W.G. C.G. ~ IN.	ROTOR RPM	FLY. COND	THRUST COEFF ~ C _T
□	7150	8130	141.0 (TMM)	325.0	LEVEL FLT.	0.003856
●	6350	7990	140.8 (TMM)	315.0	DIVE	0.006010

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. XM-28 CHIN TURRET INSTALLED (STOW'D POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL = 10.5 INCHES FROM FULL FORWARD
 LATERAL = 4.75 INCHES FROM FULL LEFT
 DIRECTIONAL = 5.75 INCHES FROM FULL LEFT
 COLLECTIVE = 8.95 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY
 REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS
 REFERENCED TO THE AIRCRAFT WATERLINE



CALIBRATED AIRSPEED - V_{CA} ~ KCAS

FIGURE No. 55
 STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AH-1G USARV 715645
 HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H ₀ -FT.	AVG. G.W. -LB.	AVG. LONG C.G.-IN.	ROTOR RPM	FLT. COND.	THRUST CONT. -CT
A	7610	7910	106.0 (PM)	323.0	CLIMB	0.00787
B	7610	7910	106.0 (PM)	323.0	AUTOROTATION	0.00787

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. 10-25 CMM THRUST INSTALLED (STOWED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.93 INCHES FROM FULL FORWARD
 LATERAL - 9.98 INCHES FROM FULL LEFT
 DIRECTIONAL - 8.97 INCHES FROM FULL LEFT
 COLLECTIVE - 8.98 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
 FROM ALL CONTROL FORCE DATA

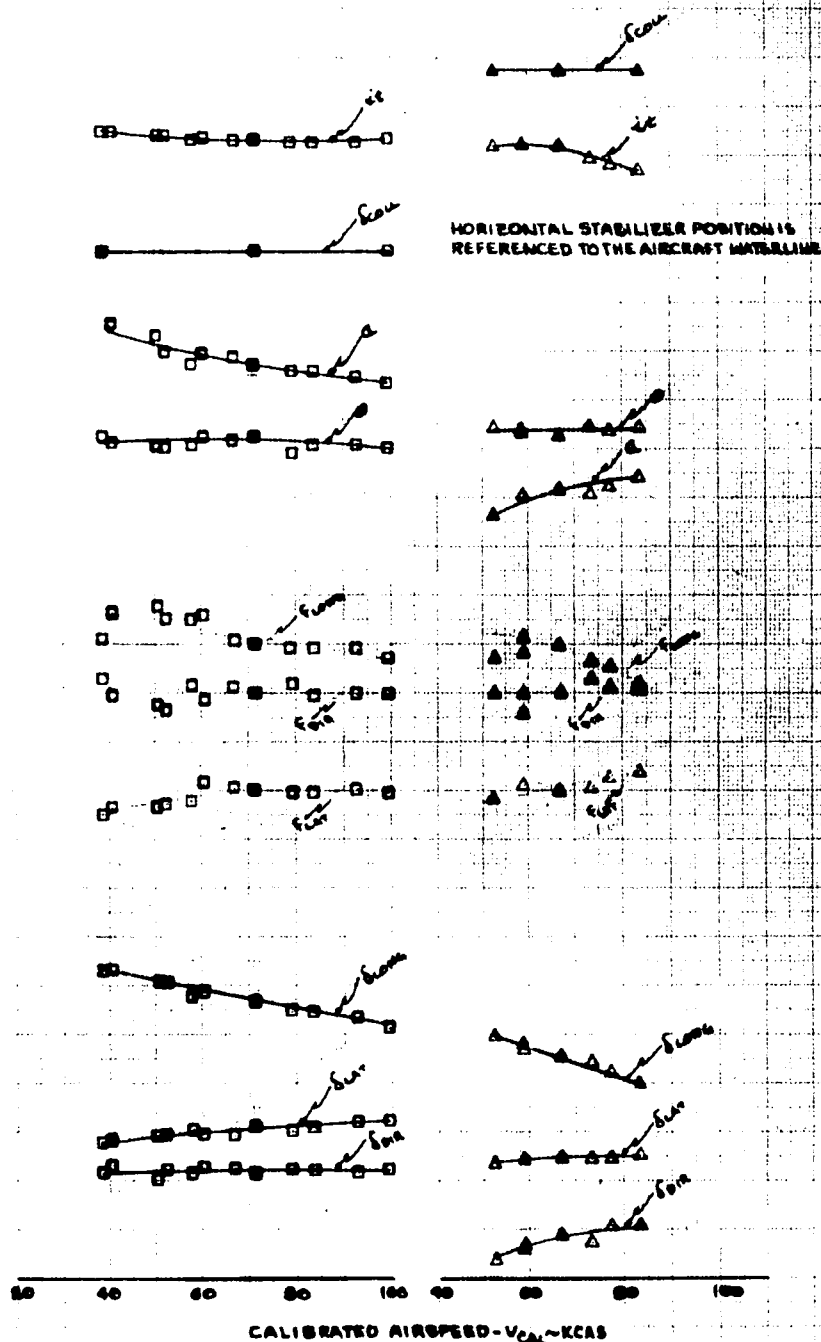
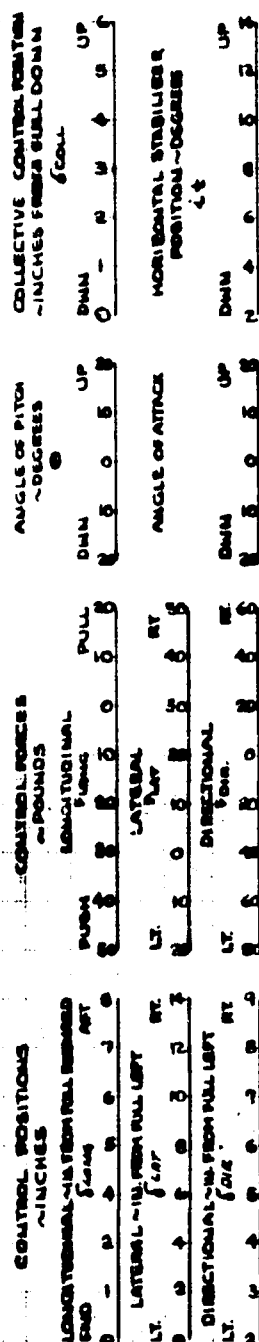


FIGURE NO. 56 STICK LONGITUDINAL COLLECTIVE FIELD STABILITY AN-60 USAF 116699

WING NO. 6 CONFIGURATION: 100% INTEREST TEST POS. PAIRINGS REMOVED

SYM. ANG. ALT. ANG. ALT. ANG. ALT. STICK. FLT. COND. THRUST COND.
 No. 97 -12.0 -12.0 -12.0 200/1000 200.0 LEVEL FLT. 0.00000
 4000 4000 4000 200/1000 200.0 LEVEL FLT. 0.00000
 4000 4000 4000 200/1000 200.0 LEVEL FLT. 0.00000

- NOTES: 1. SOLID SYMBOLS DENOTE TEST POINTS
 2. 10-00000 TARGET NUMBER (BOMED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL: 10.0 INCHES FROM FULL FORWARD
 LATERAL: 5.0 INCHES FROM FULL LEFT
 DIRECTIONAL: 5.0 INCHES FROM FULL LEFT
 COLLECTIVE: 5.0 INCHES FROM FULL DOWN
 4. BREAK OUT SYMBOLS HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

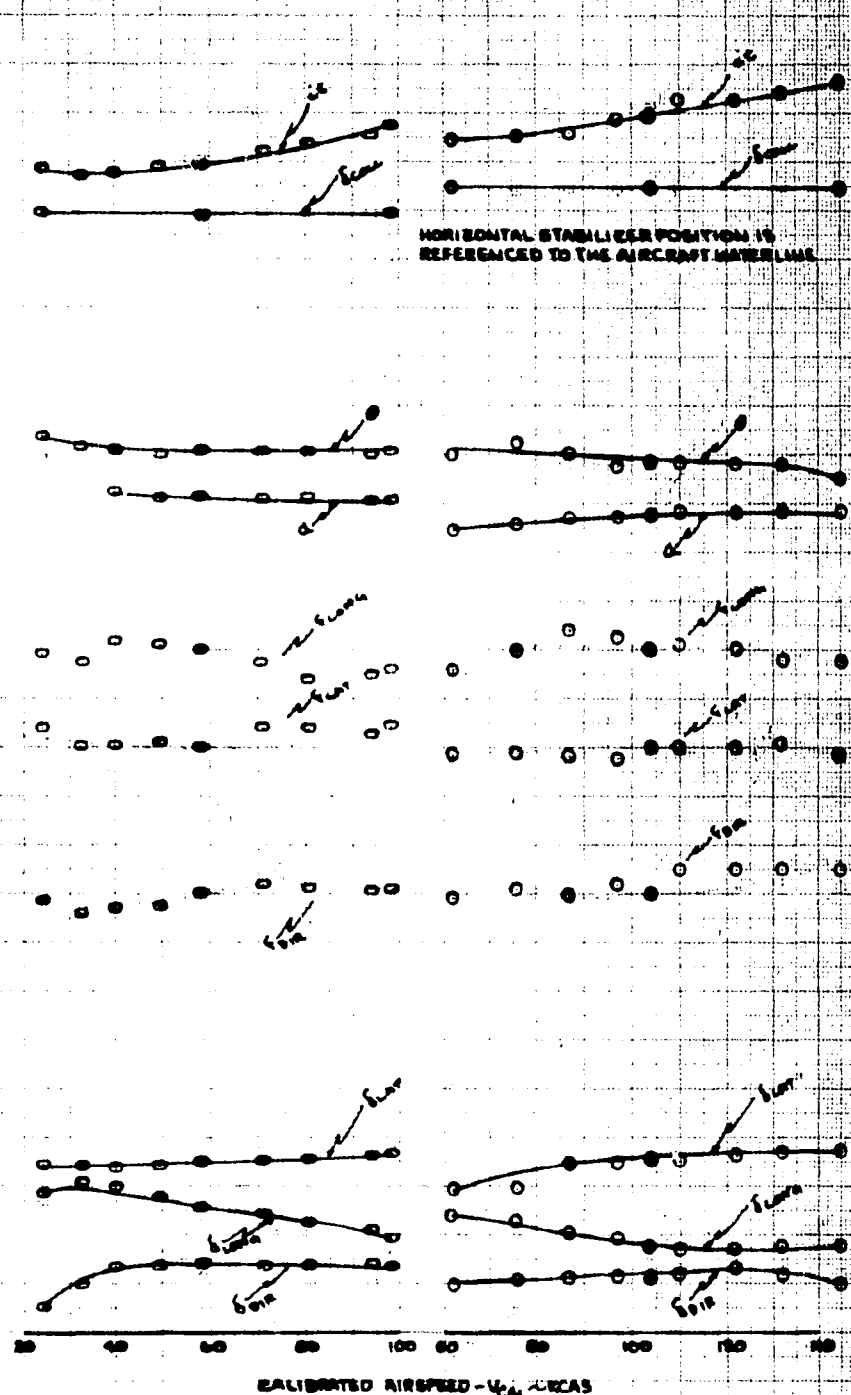
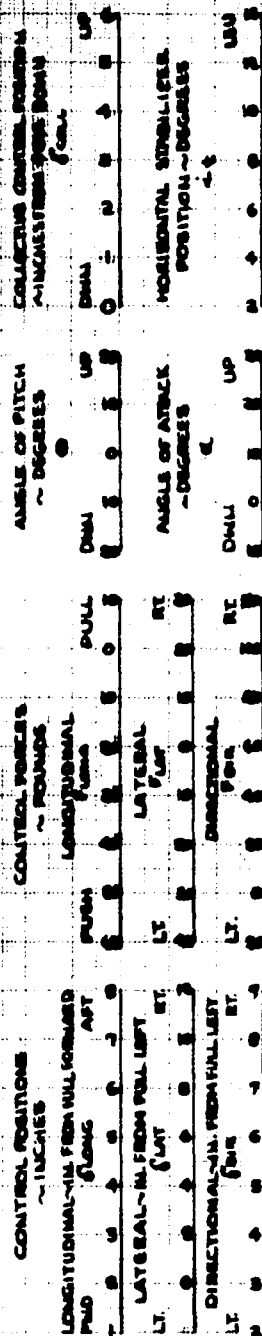


FIGURE No. 57
 STATIC LONGITUDINAL COLLECTIVE FINED STABILITY
 AN-18 USAF 118678

NAVY MOD CONFIGURATION WITH ROCKET PODS REMOVED

SYM.	AVG. ALT. ~ FT.	AVG. G.M. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEF. ~ C _T
▽	3000	8500	280.0 (FT)	3250	LEVEL FLT.	0.004418
◆	4550	8755	280.6 (FT)	3250	DIVE	0.006069

NOTES: 1. SOLID SYMBOLS DENOTE TEST POINTS

2. EX-28 CHU TERRY INSTALLED (STRENGTH POSITION)

3. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL: 10.0 INCHES FROM FULL FORWARD

LATERAL: 1.0 INCHES FROM FULL LEFT

DIRECTIONAL: 1.0 INCHES FROM FULL LEFT

COLLECTIVE: 1.0 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

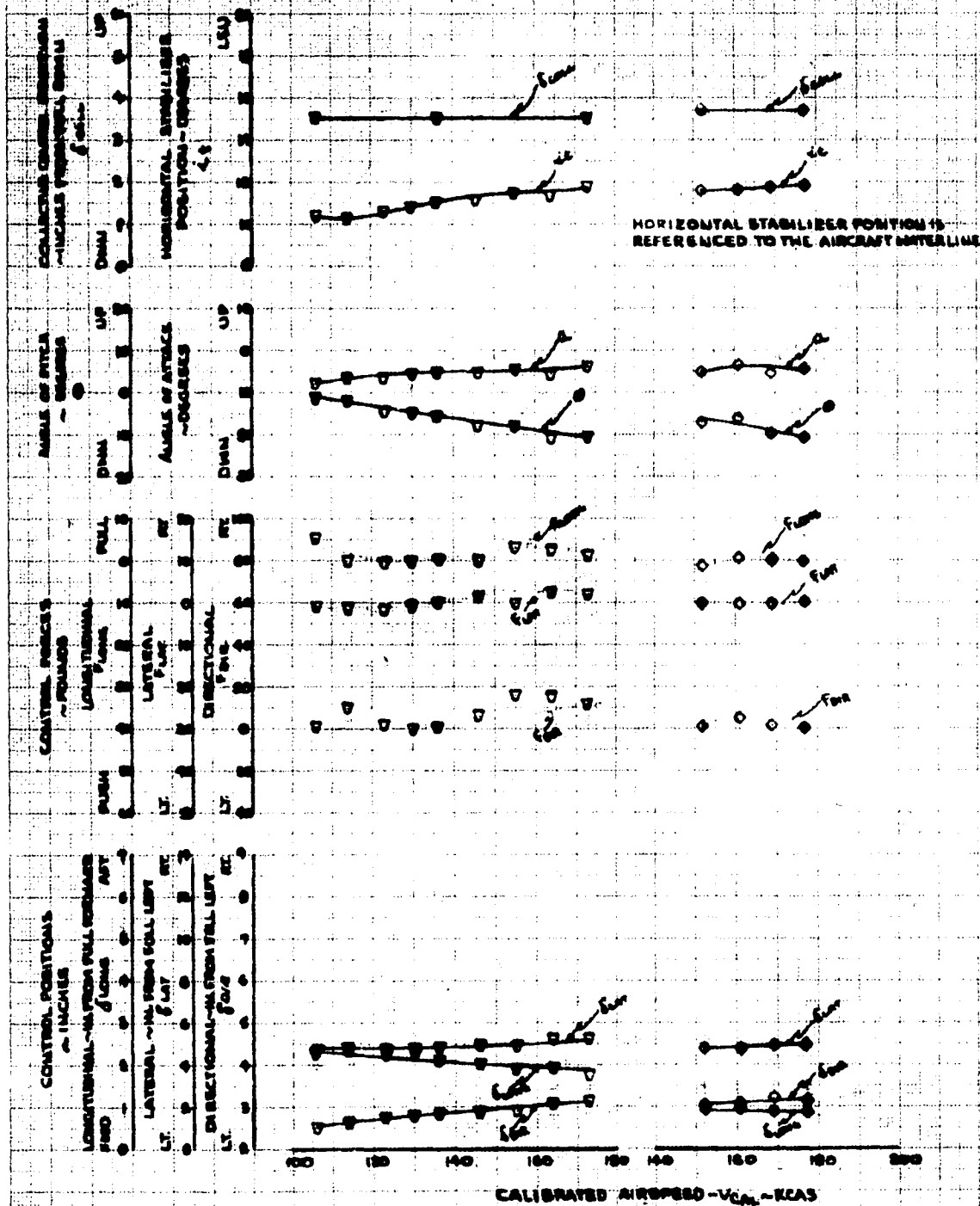


FIGURE NO. 58
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AH-1G USRAH1964S
 HWY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. Hq-FT.	AVG. GM. ~LB.	AVG. LONG. CG ~ IN.	ROTOR RPM	PLT. COND. THRUST COEFF. ~ C _T
▲	6820	6825	801.0(AFT)	220.0	CLIMB 0.000003
■	6820	6825	801.0(AFT)	220.0	AUTOROTATION 0.000003

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. 2-28 CHIN THRUST INSTALLED (STORED POSITION)
 3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 10.85 INCHES FROM FULL FORWARD
 LATERAL - 4.90 INCHES FROM FULL LEFT
 DIRECTIONAL - 5.91 INCHES FROM FULL LEFT
 COLLECTIVE - 8.98 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

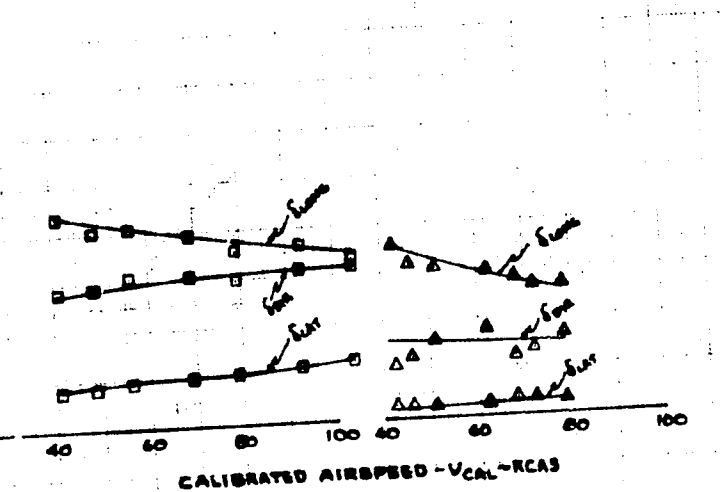
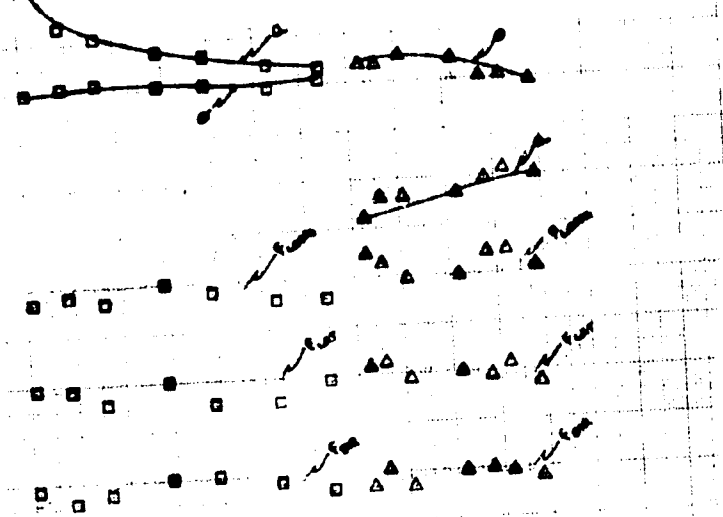
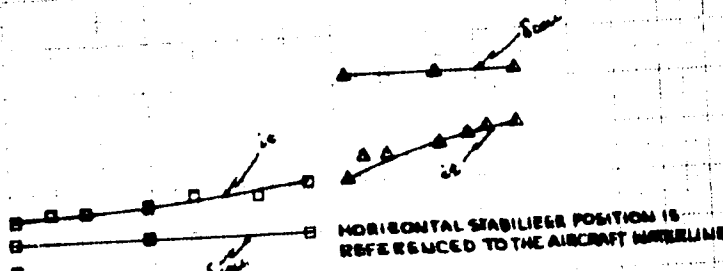
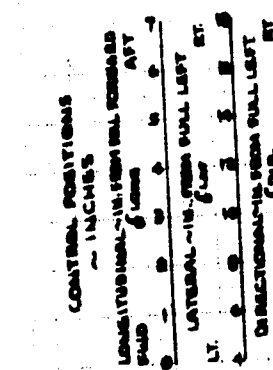
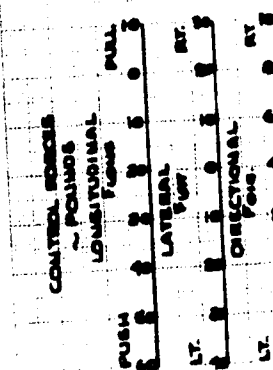
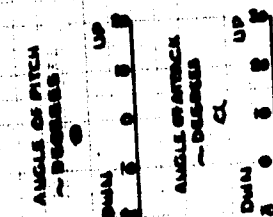
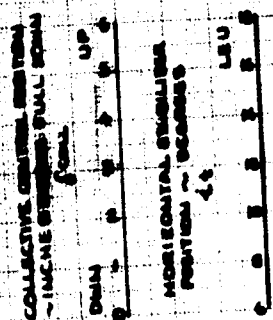


FIGURE NO. 59
STATIC LONGITUDINAL COLLECTIVE FLEX STABILITY
AM-1C USAF 118698

NAV. MOD. CONFIGURATION WITH ROCKET PORTAINING REMOVED

SYM.	AVE. ALT. H. - FT.	AVE. EN. - LBS.	AVE. LONG. CG - IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. - C _T
0	4100	1648	7880 (MT)	826.0	LEVEL FLT.	0.005370
0	4100	1648	8000 (MT)	824.0	LEVEL FLT.	0.005104

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS

2. 28-28 CHIN THRUST INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL - 10.05 INCHES FROM FULL FORWARD

LATERAL - 9.90 INCHES FROM FULL LEFT

DIRECTIONAL - 5.97 INCHES FROM FULL LEFT

COLLECTIVE - 8.98 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

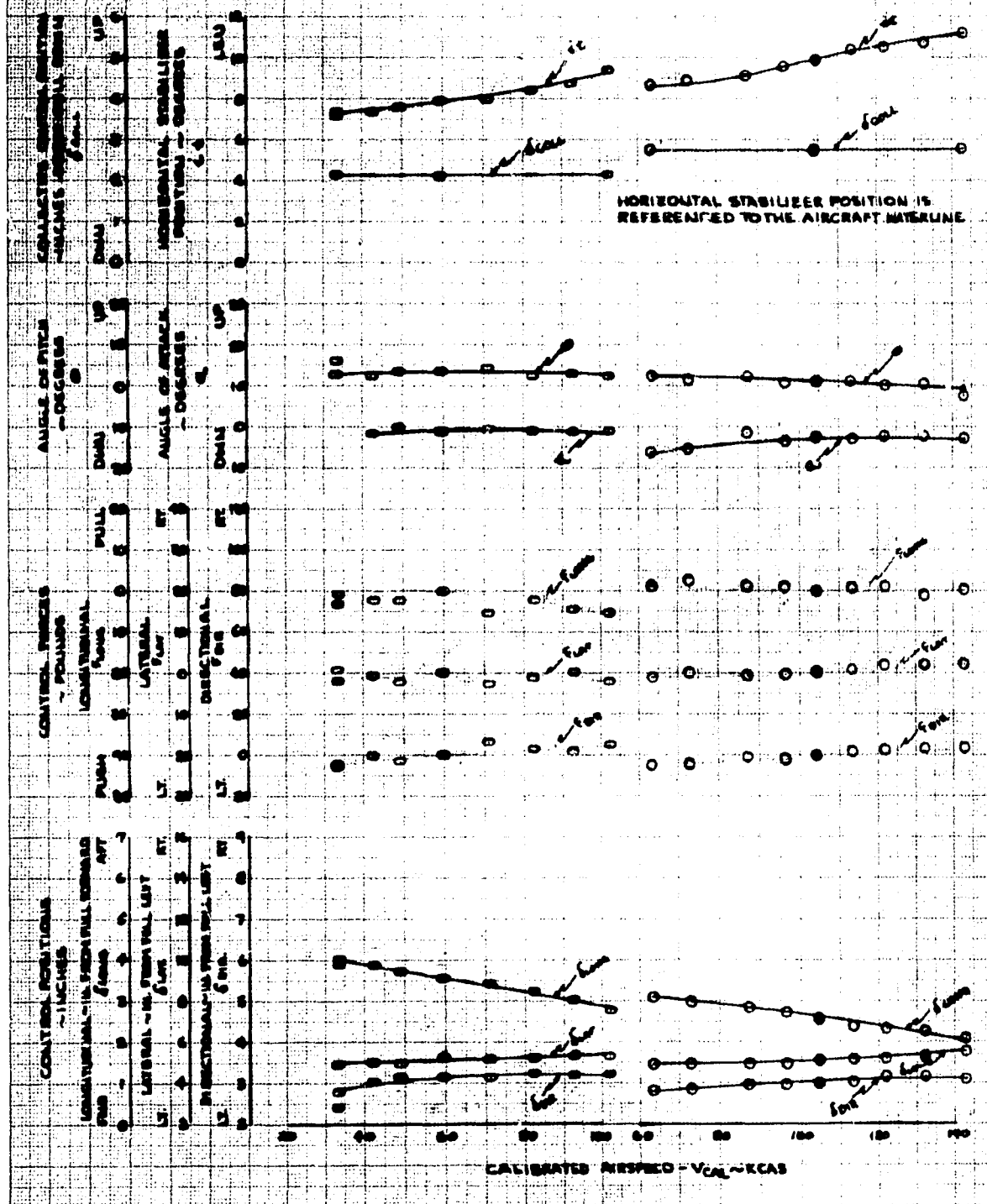


FIGURE No. 40
STATIC LONGITUDINAL COLLECTIVE FINESTABILITY
AN-10 USAF 1964

HVV, HOS CONFIGURATION WITH RECENT PERFORMANCE IMPROVEMENT

SYM	AVE. ALT. H ₀ ~ FT	AVE. S.M. ~ LB	AVE. LONG. CG ~ IN	ROTOR RPM	FLY. COND.	THRUST COEFF.
•	6510	7000	200.5 (MT)	2200	LEVEL FLT	0.00015
•	4000	7100	200.5 (MT)	2200	DIVE	0.00015

NOTES: 1. SOLID SYMBOLS SHOWS TEST POINTS

2. IN-20 CHIN TARGET INSTALLED (FIXED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL: 10.0 INCHES FROM FULL FORWARD

LATERAL: 1.0 INCHES FROM FULL LEFT

SPIN: 1.0 INCHES FROM FULL LEFT

COLLECTIVE: 1.0 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

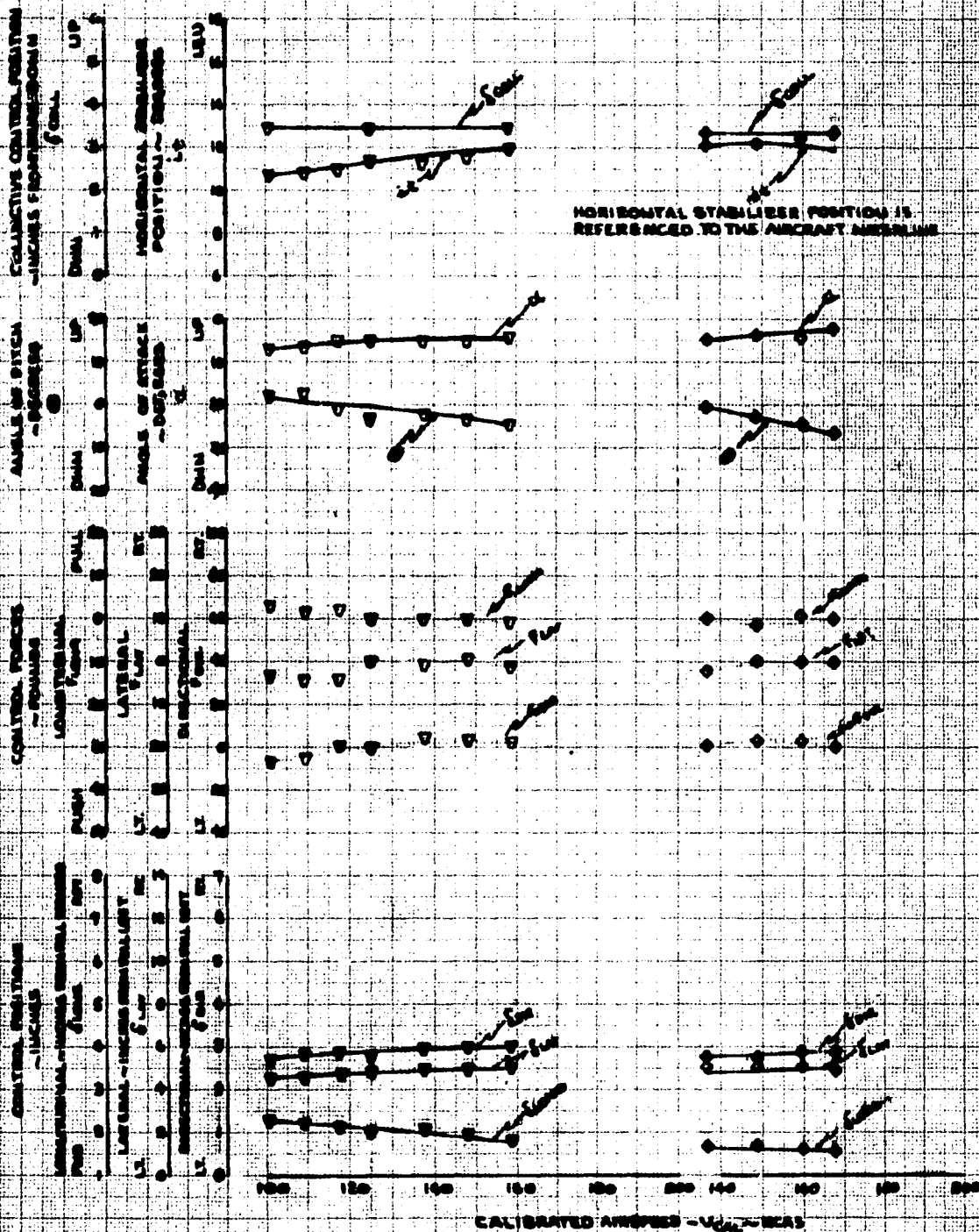


FIGURE No. 61
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AH-1G USAF 715685
 HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVE. ALT ~FT	AVE. S.M. ~LB	AVE. LONG. CG ~IN.	ROTOR RPM	FLT. COND	THRUST COEFF ~C _T
▲	7450	8750	200.5 (AFT)	323.0	CLIMB	0.005470
□	7440	8720	200.5 (AFT)	329.0	AUTOROTATION	0.005341

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. XM-28 CHIN TURRET INSTALLED (STOWED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD
 LATERAL = 9.90 INCHES FROM FULL LEFT
 DIRECTIONAL = 3.97 INCHES FROM FULL LEFT
 COLLECTIVE = 8.98 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

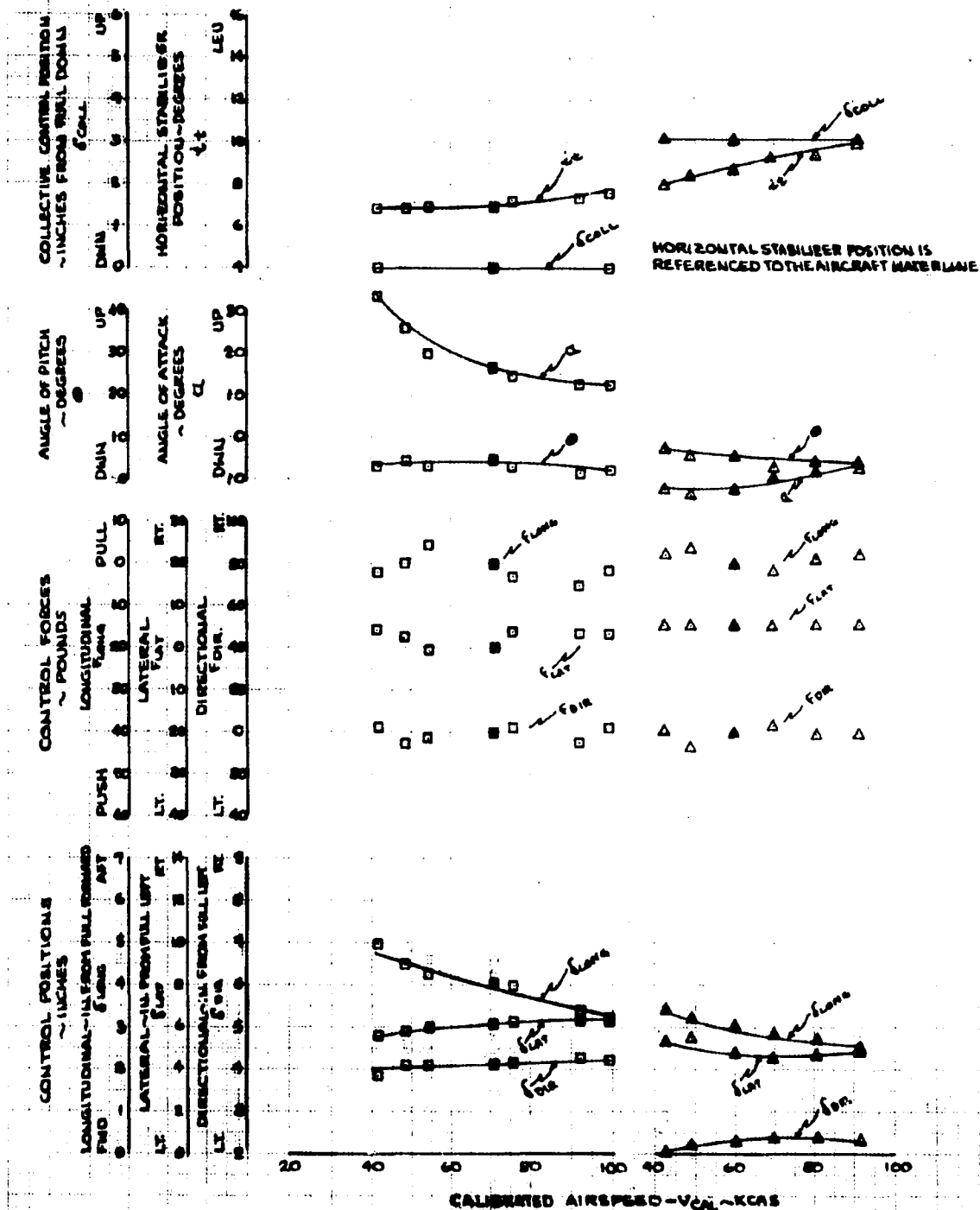


FIGURE No. 62
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AH-1G UH-1H 15698
 H.V. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. HGT. ~ FT.	AVG. GW. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C _T
0	14140	8700	200.6 (AFT)	324.0	LEVEL FLT.	0.006676
0	14720	8510	200.7 (AFT)	322.0	LEVEL FLT.	0.006785

NOTES: 1. SOLID SYMBOLS DENOTES TRIM POINTS

2. XM-28 CHIN THRUST INSTALLED (STOWED POSITION)

3. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.0 INCHES FROM FULL FORWARD

LATERAL = 9.10 INCHES FROM FULL LEFT

DIRECTIONAL = 5.9 INCHES FROM FULL LEFT

COLLECTIVE = 8.9 INCHES FROM FULL DOWN

4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

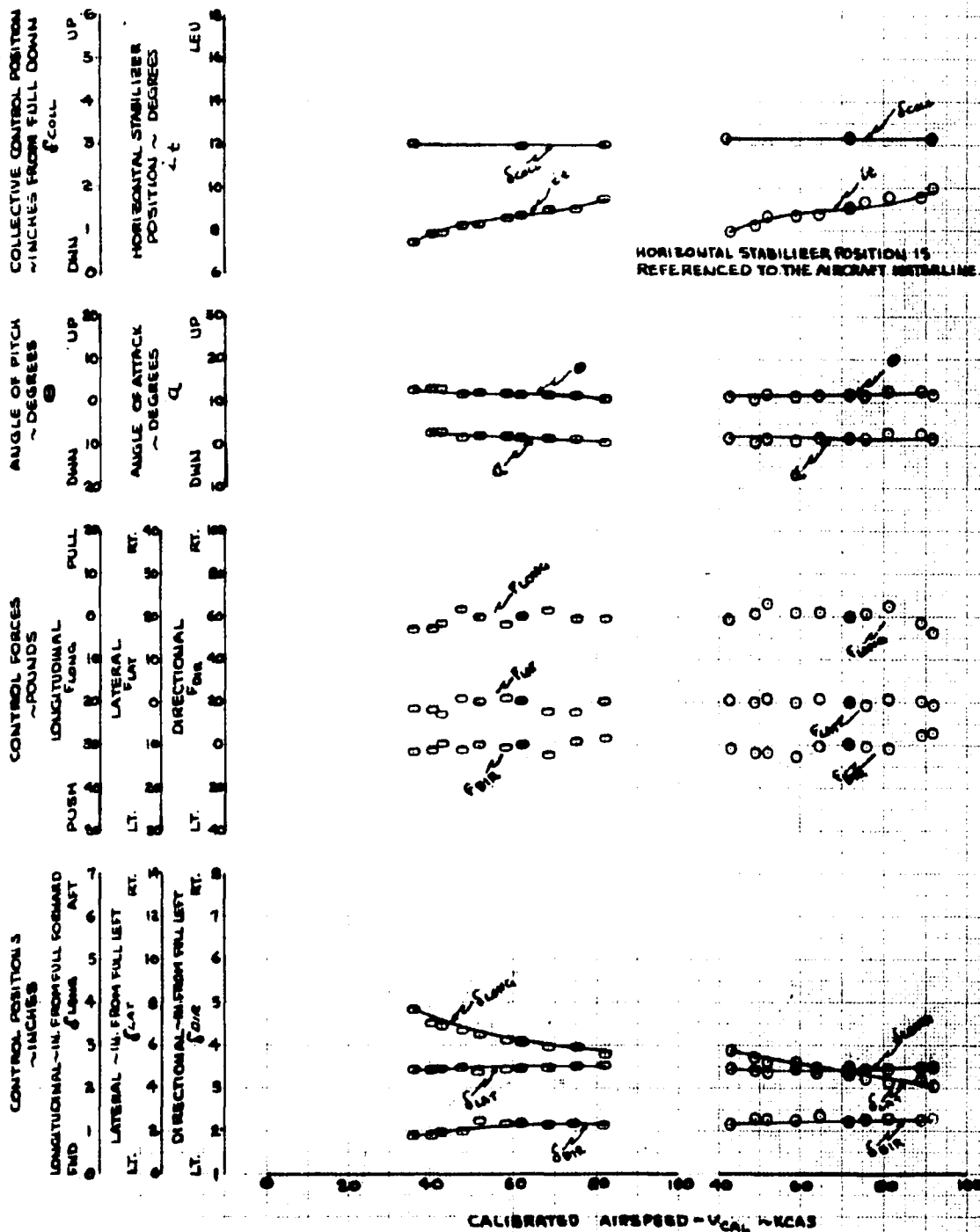


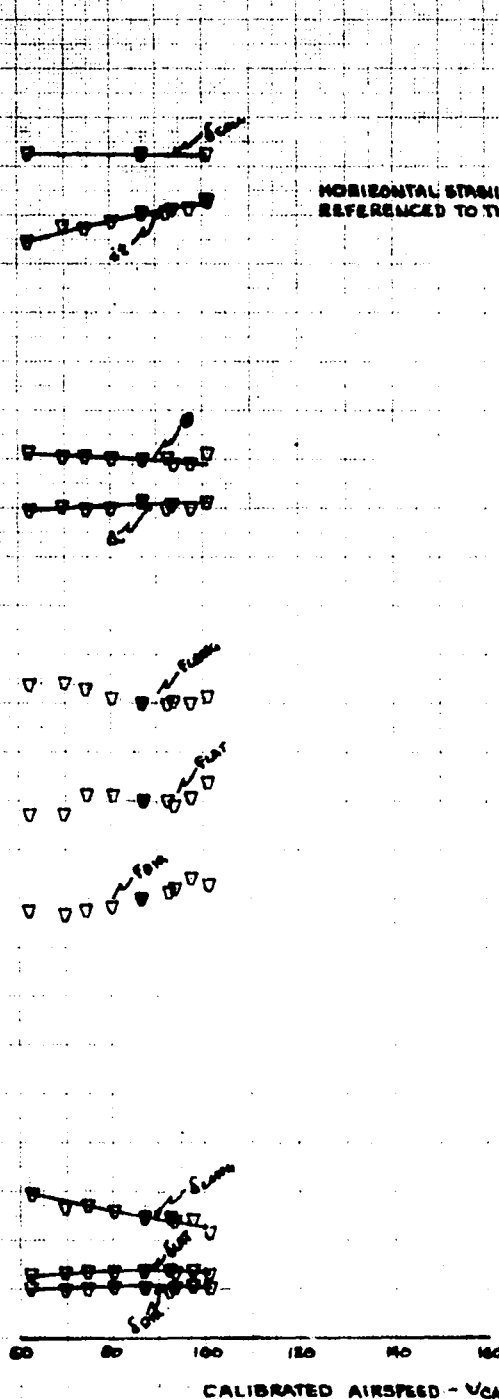
FIGURE NO. 63 STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY

AN-10 USAF 1969

NAV. HQS CONFIGURATION WITH ROCKET PED FAIRINGS REMOVED

SYM AVE ALT. AVE G.W. AVE LONG. ROTOR FLT COND. THRUST COEFF
 7 15000 6450 6000 (AFT) 2500 LEVEL SLT. 0.006115

NOTES: 1. SOLID SYMBOLS DENOTE TEST POINTS
 2. 100% CAN THRUST INSTALLED (DOWNED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.00 INCHES FROM FULL FORWARD
 LATERAL - 0.90 INCHES FROM FULL LEFT
 DIRECTIONAL - 0.87 INCHES FROM FULL LEFT
 COLLECTIVE - 0.90 INCHES FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
 FROM ALL CONTROL FORCE DATA

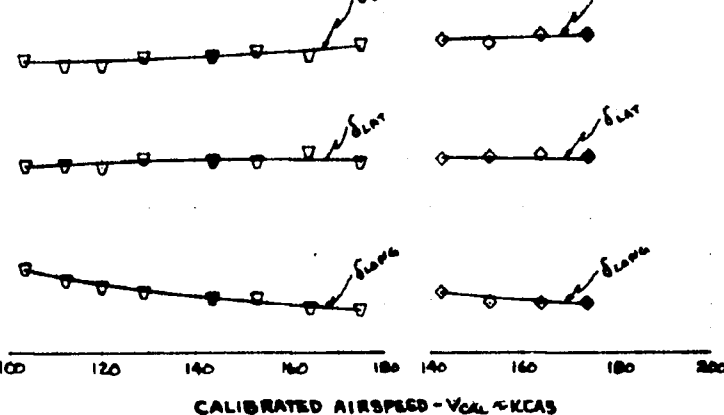
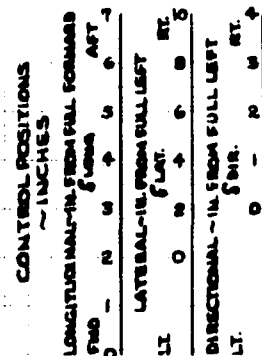
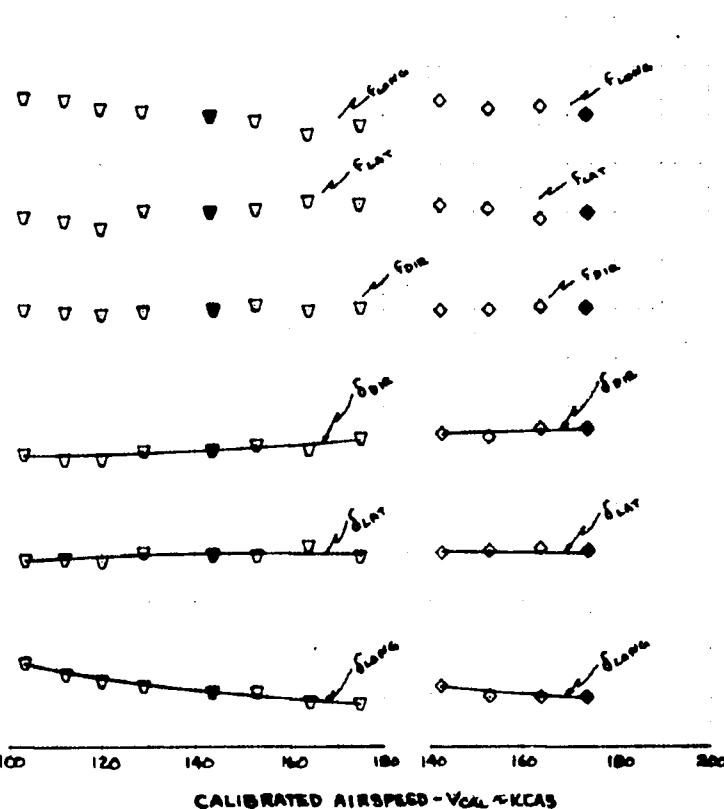
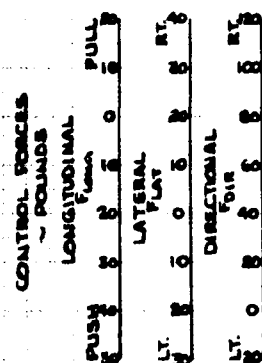
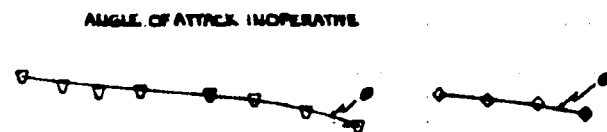
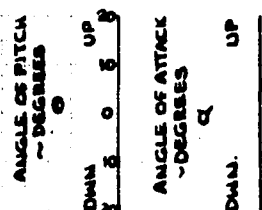
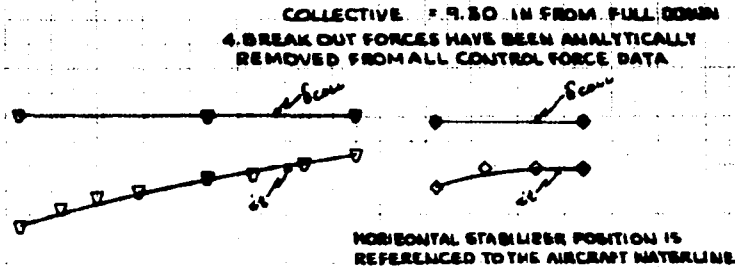
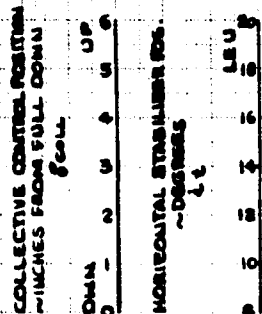


HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

FIGURE No. 64
STATIC LONGITUDINAL COLLECTIVE FIXED STABILITY
 AH-1G OBA 6618847
 CLEAN CONFIGURATION WITH SKIDTUBE FAIRINGS REMOVED

SYM.	AVG. ALT. H ₀ ~ FT.	AVG. G.M. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C _T	FLY. COND.
▽	5160	8440	199.7 (AFT)	522.0	0.004978	LEVEL FLY.
◇	4570	8390	199.7 (AFT)	522.0	0.004881	DIVE

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. TATIOB CHIN TURRET INSTALLED (STORED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL: 9.07 IN. FROM FULL FORWARD
 LATERAL: 10.00 IN. FROM FULL LEFT
 DIRECTIONAL: 7.07 IN. FROM FULL LEFT
 COLLECTIVE: 9.30 IN. FROM FULL DOWN
 4. BREAK OUT FORCES HAVE BEEN ANALYTICALLY
 REMOVED FROM ALL CONTROL FORCE DATA



CALIBRATED AIRSPEED - V_{CL} ~ KIAS

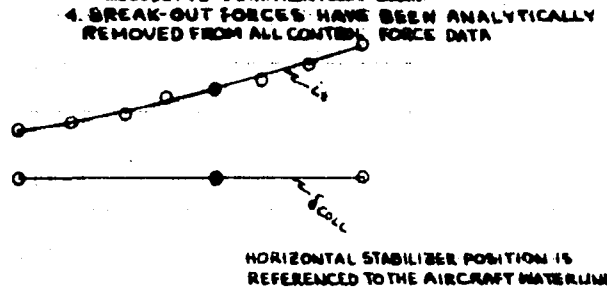
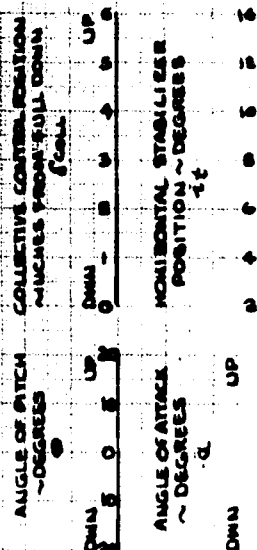
FIGURE No. 65 STATIC LONGITUDINAL COLLECTIVE FINE STABILITY

AH-1G USA 2615247

CLEAN CONFIGURATION WITH SKID TUBE FAIRINGS REMOVED

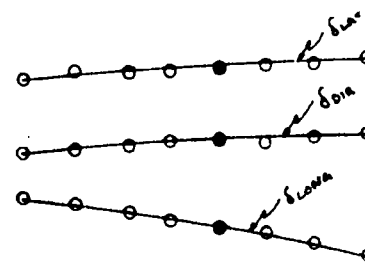
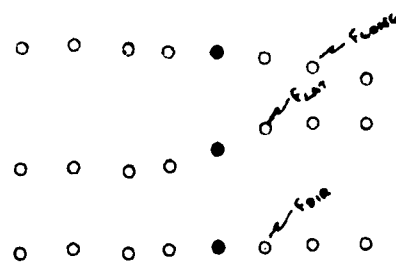
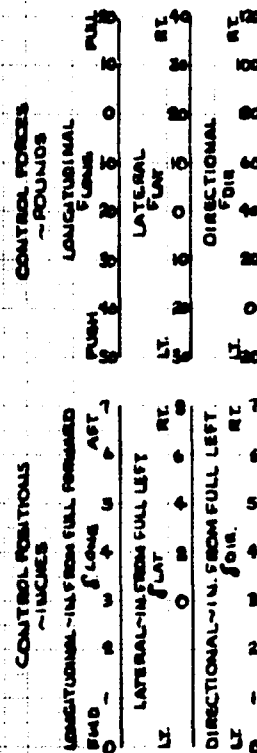
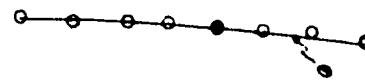
SYM	AVG. ALT. H ₀ ~ FT.	AVG. GN. ~ LB.	AVG. LONG. C.G. ~ IN.	ENGINE RPM	THRUST COEFF. ~ C _T	FLY. COND.
0	4170	8585	199.8 (AFT)	322.0	0.004915	LEVEL FLY.

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINTS
 2. TAT 102 CHIN TURRET INSTALLED (STORED POSITION)
 3. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL = 9.8 IN. FROM FULL FORWARD
 LATERAL = 10.0 IN. FROM FULL LEFT
 DIRECTIONAL = 7.0 IN. FROM FULL LEFT
 COLLECTIVE = 9.5 IN. FROM FULL DOWN
 4. BREAK-OUT FORCES HAVE BEEN ANALYTICALLY
 REMOVED FROM ALL CONTROL FORCE DATA



HORIZONTAL STABILIZER POSITION IS REFERENCED TO THE AIRCRAFT WATERLINE

ANGLE OF ATTACK IMOPERATIVE



CALIBRATED AIRSPEED - V_{CA} ~ KCAS

FIGURE NO. 66 SUMMARY OF LATERAL DIRECTIONAL STABILITY

AM-16 USAF 715698

GROSS WEIGHT COMPARISON

SYM	WGT. ALT. -LB.	WGT. GRWT. -LB.	WGT. LONG CG -IN.	WGT. SPEED -KPH	WGT. THRUST -CT	WGT. QDEF. -CT	WGT. CONFIGURATION
○	6080	8340	200.0 (W)	323.5	0.004470	0.004470	WVY. NOG
△	8170	9465	200.0 (W)	323.5	0.005540	0.005540	WVY. NOG
▽	4750	7765	201.3 (W)	323.5	0.004551	0.004551	WVY. NOG

NOTES: 1. POINTS DERIVED FROM FIGURES 82 THROUGH 89, APPENDIX III

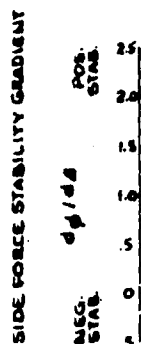
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT

3. CROSSED SYMBOLS DENOTE DIVE

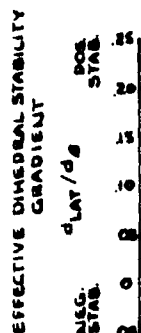
4. FLAGGED SYMBOLS DENOTE CLIMB

5. TAILED SYMBOLS DENOTE AUTOROTATION

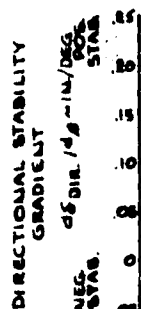
NOTE: POSITIVE ROLL ATTITUDE STABILITY SIGNIFIES INCREASING RIGHT BANK ANGLE WITH INCREASING RIGHT SIDESLIP



NOTE: POSITIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDESLIP



NOTE: POSITIVE DIRECTIONAL STABILITY SIGNIFIES AN INCREASING LEFT DIRECTIONAL CONTROL REQUIREMENT WITH INCREASING RIGHT SIDESLIP

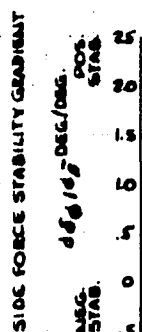


CALIBRATED AIRSPEED - V_{CL} - KCAS

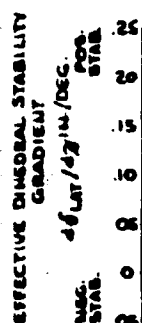
FIGURE No. 67
SUMMARY OF LATERAL DIRECTIONAL STABILITY
AH-1G USAM15648
C.G. & CONFIGURATION COMPARISON

SYM	AVG. ALT. M - FT.	AVG. GENT ~ LB	AVG. LONG. C.G. ~ IN	ROTOR RPM	THRUST COEFF. ~ C _T	CONFIGURATION
○	8000	8240	149.2 (APT)	323.0	0.004685	CLEAN
□	8070	8080	141.1 (FWD)	324.5	0.006198	HVV. HOG
◇	8080	8310	200.9 (APT)	323.5	0.006470	HVV. HOG
△	8010	8680	200.1 (APT)	326.5	0.005085	OUT'D ALTERNATE
D	6750	8550	201.0 (APT)	325.0	0.005088	HVV. SCOUT

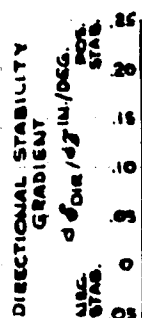
NOTES: 1. POINTS DERIVED FROM FIGURES 70 THROUGH 81
AND 82 THROUGH 87, APPENDIX III
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION



NOTE: POSITIVE ROLL ATTITUDE STABILITY SIGNIFIES INCREASING RIGHT BANK ANGLE WITH INCREASING RIGHT SIDESLIP



NOTE: POSITIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDESLIP



NOTE: POSITIVE DIRECTIONAL STABILITY SIGNIFIES AN INCREASING LEFT DIRECTIONAL CONTROL REQUIREMENT WITH INCREASING RIGHT SIDESLIP

CALIBRATED AIRSPEED - V_{CAL} - KCAS

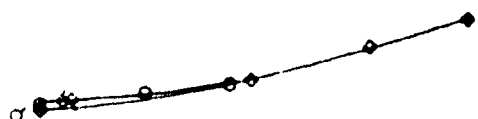
FIGURE NO. 68
SUMMARY OF LATERAL DIRECTIONAL STABILITY
AH-1G USAF T15695
ALTITUDE COMPARISON

SYM.	Avg. ALT. ft.	Avg. GWT. lb.	Avg. LONG. C.G. ~ in.	ROTOR THRUST lb	COEFF.	CONFIGURATION
○	6080	8510	200.4 (4ft)	323.5	0.004270	HVV. HDS
○	14440	8510	200.8 (4ft)	324.0	0.006687	HVV. HDS

- NOTES: 1. POINTS DERIVED FROM FIGURES 85 THROUGH 92
AND 91 THROUGH 93, APPENDIX III
2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTORELATION

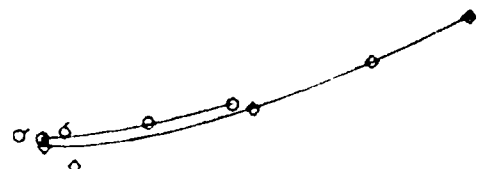
SIDE FORCE STABILITY GRADIENT
 $d\delta / d\beta$ DEG/DEG
POS. STAB.
NEG. STAB.

NOTE: POSITIVE ROLL ATTITUDE STABILITY SIGNIFIES RIGHT BANK ANGLE WITH INCREASING RIGHT SIDE SLIP



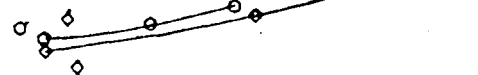
EFFECTIVE DIHEDRAL STABILITY GRADIENT
 $d\delta_{lat} / d\beta$ IN/DEG
POS. STAB.
NEG. STAB.

NOTE: POSITIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDE SLIP



DIRECTIONAL STABILITY GRADIENT
 $d\delta_{dir} / d\beta$ IN/DEG
POS. STAB.
NEG. STAB.

NOTE: POSITIVE DIRECTIONAL STABILITY SIGNIFIES AN INCREASING LEFT DIRECTIONAL CONTROL REQUIREMENT WITH INCREASING RIGHT SIDE SLIP



CALIBRATED AIRSPEED - V_{CAL} ~ KCAS

FIGURE No. 69
SUMMARY OF LATERAL DIRECTIONAL STABILITY
AH-1G

SYM	AVG. ALT. Wt - FL	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	MOTOR RPM	THRUST COEFF	CONFIGURATION	AIRCRAFT S/N
O	3700	8770	200.3(AFT)	323.0	0.004889	CLEAN (LANDING GEAR CROSS TUBE FAIRINGS REMOVED)	615247
A	5400	8290	199.2(AFT)	323.0	0.004865	CLEAN	718695

NOTES: POINTS DERIVED FROM FIGURES 70, 71, 94-695, APP VII

2. OPEN SYMBOLS DENOTE LEVEL FLIGHT
3. CROSSED SYMBOLS DENOTE DIVE

NOTE: POSITIVE EFFECTIVE DIHEDRAL STABILITY SIGNIFIES AN INCREASING
RIGHT LATERAL CYCLIC REQUIREMENT WITH INCREASING RIGHT SIDESLIP

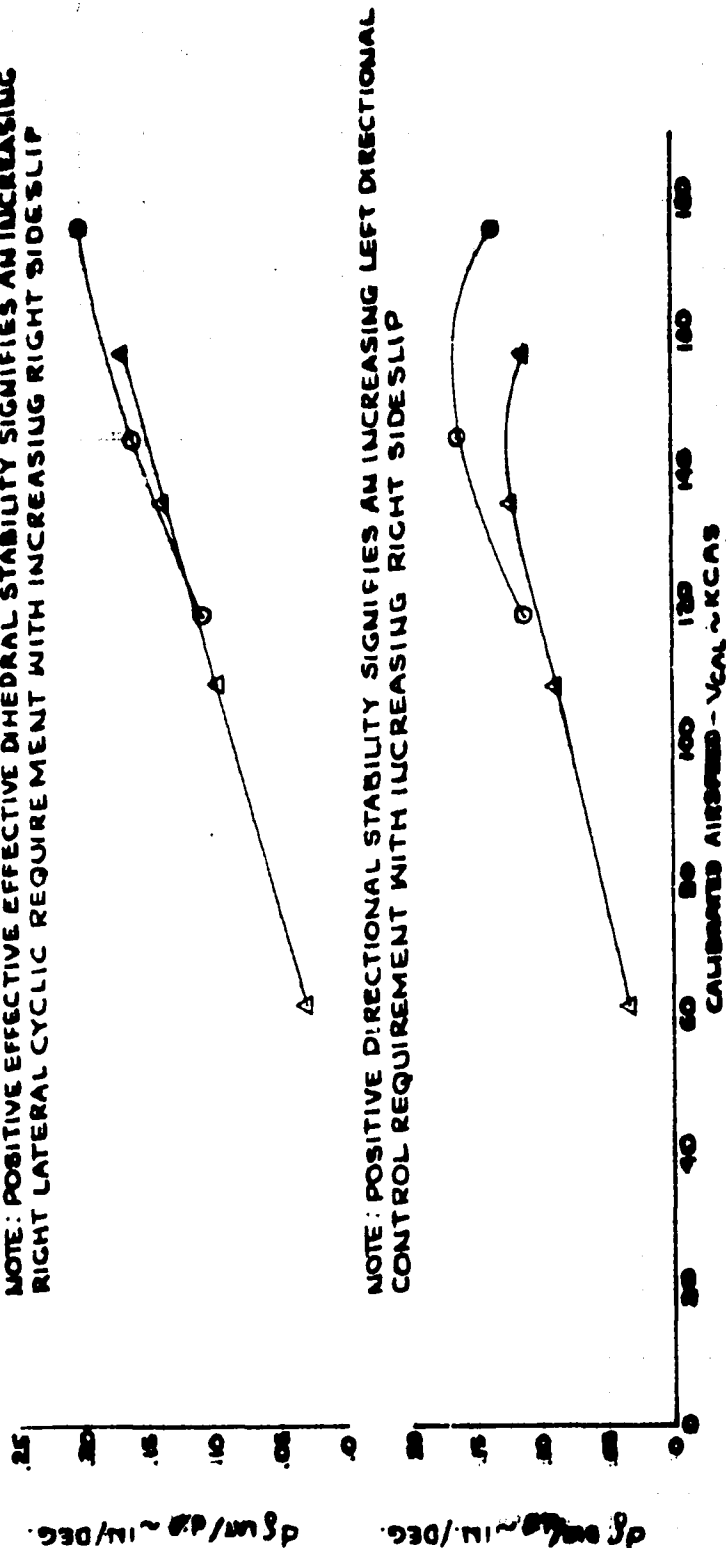


FIGURE 10 TO STATIC LATERAL DIRECTIONAL STABILITY AH-64 USAF 1964 CLEAN CONFIGURATION

SYM	ALTITUDE ~ CAS	ANG. ALT. ~ FT	ANG. RM ~ LB	ANG. LONG. C.G. ~ IN	ROTOR RPM	FLY. COND. TARGET CMT
●	50.0	4500	8500	100.0 (ACT)	550.0	LEVEL FLT. 00000000
○	110.5	4000	8500	100.0 (ACT)	550.0	LEVEL FLT. 00000000

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION: 25.0 PERCENT FROM FULL DOWN

4. RM-20 (MM) TARGET (BANK)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL: 10.0 INCHES FROM FULL FORWARD

LATERAL: 4.90 INCHES FROM FULL LEFT

DIRECTIONAL: 5.97 INCHES FROM FULL LEFT

COLLECTIVE: 0.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

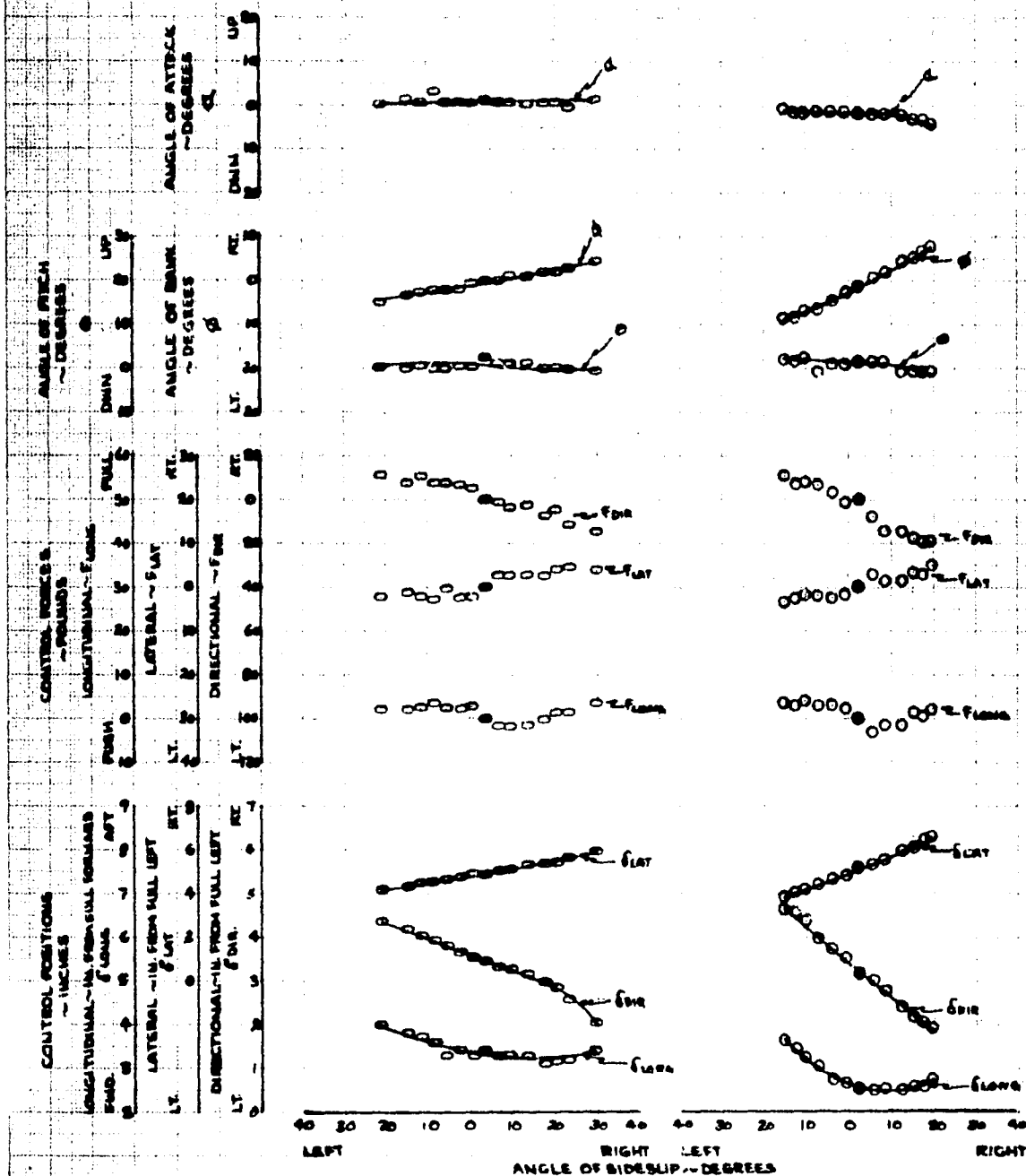


FIGURE NO. 71 STATIC LATERAL DIRECTIONAL STABILITY AM-10 USAFUTIGER CLEAN CONFIGURATION

SYM	APPROX WIND KTS	ANG ALT H-FT	ANG GN -LB	ANG IENG C.G. -IN	SPIN RPM	FLY COND	THROTTLE POS
0	145	550	875	144 (EAST)	215	LEVEL	80%
0	145	440	825	144 (EAST)	215	DIVE	80%

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT BANK ATTITUDE 0 DEG BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = 21% PERCENT FROM FULL DOWN
4. KM-28 CHIN THROTTLE (STOWED)
5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL = 10.0 INCHES FROM FULL FORWARD
 LATERAL = 9.9 INCHES FROM FULL LEFT
 DIRECTIONAL = 8.9 INCHES FROM FULL LEFT
 COLLECTIVE = 8.9 INCHES FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

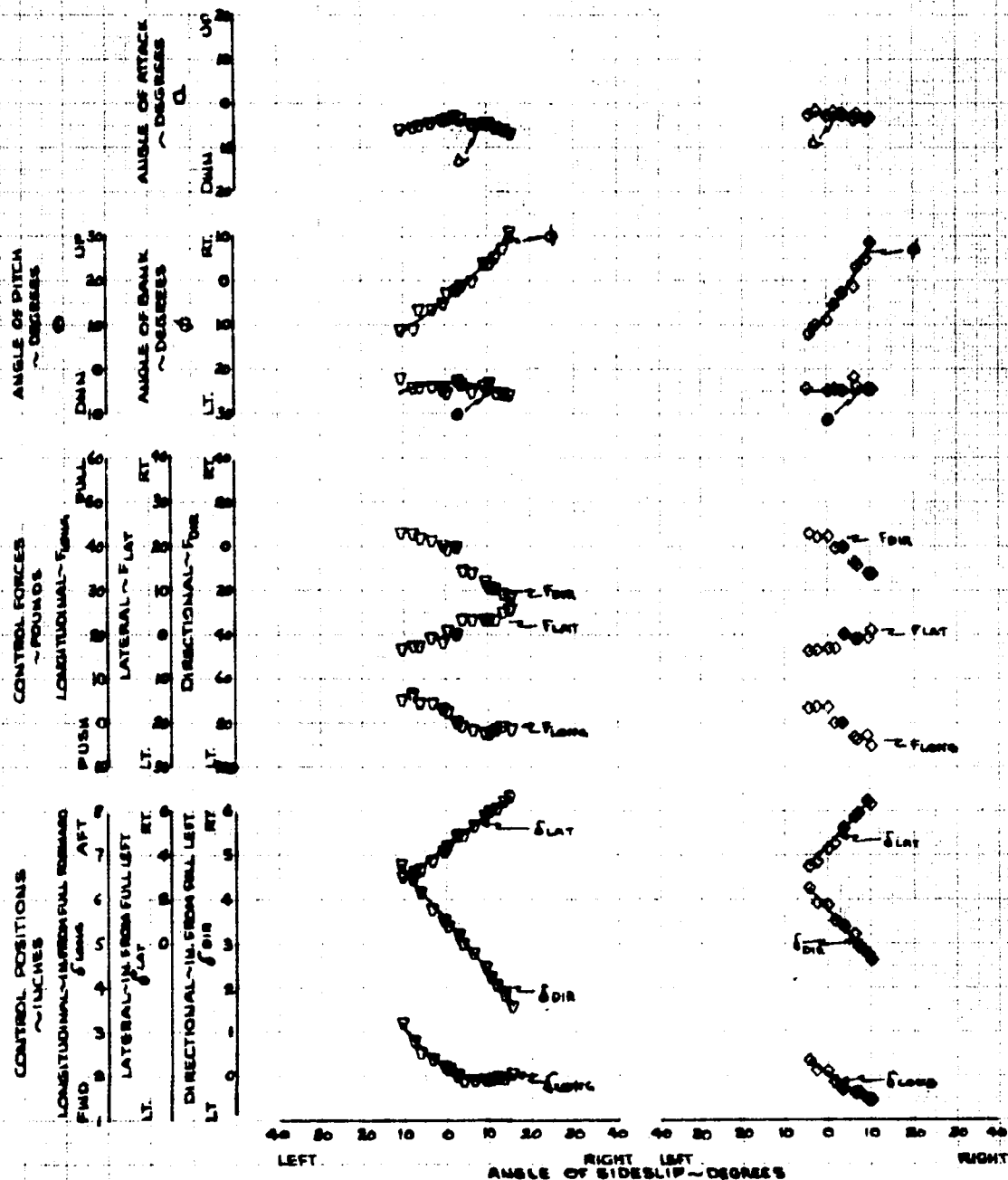


FIGURE No. 72 STATIC LATERAL DIRECTIONAL STABILITY AH-1G USAF/15678 CLEAN CONFIGURATION

SYM	AIR SPEED ~ KCAS	AVG ALT. ~ FT.	AVG G.M. ~ LB	AVG LONG. C.G. ~ IN.	ROTOR RPM	SLT. COND. THROTTLE ~ CT
Δ	215	2650	7995	199.1 (AFT)	325.0	CLUNG 0.004735
□	225	2550	7970	199.1 (AFT)	319.0	2075 0.005875

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE BACK POSITION = 36.4 PERCENT FROM FULL DOWN

4. 1M-25 CM THROTTLE (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.05 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.87 INCHES FROM FULL LEFT

COLLECTIVE = 8.90 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

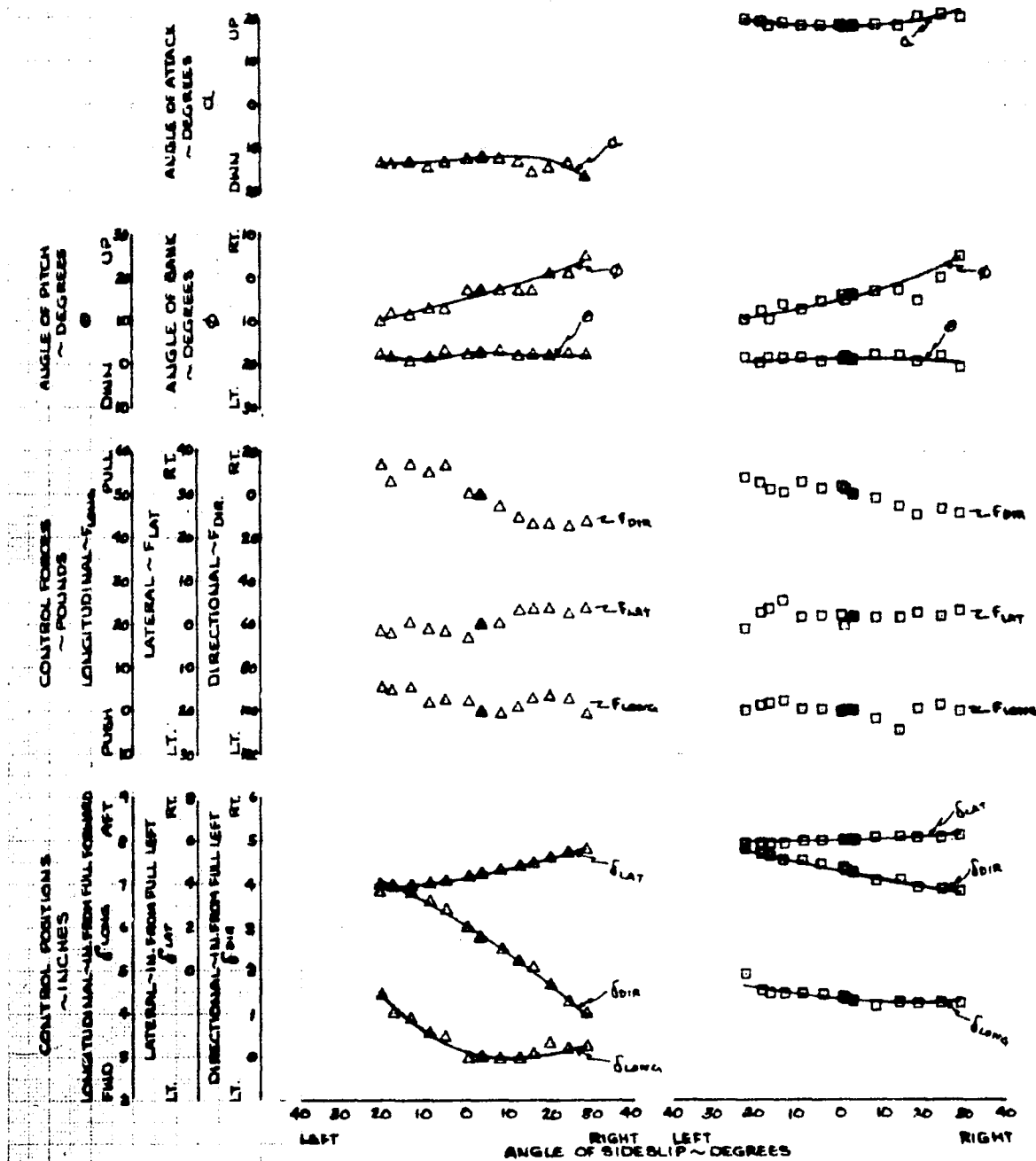


FIGURE NO. 75
STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USAF 15648

OUT 80 ALTERNATE CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ KIAS	AVG. ALT. H ₀ ~ FT	AVG. GN. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND. THRUST COEFF. ~ C _T
0	82.0	4850	8715	200.4 (AFT)	325.0	LEVEL FLT. 0.004494
0	100.0	5780	8765	200.4 (AFT)	324.0	LEVEL FLT. 0.005186

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION 21.0 PERCENT FROM FULL DOWN

4. XM-28 CMU TURST (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

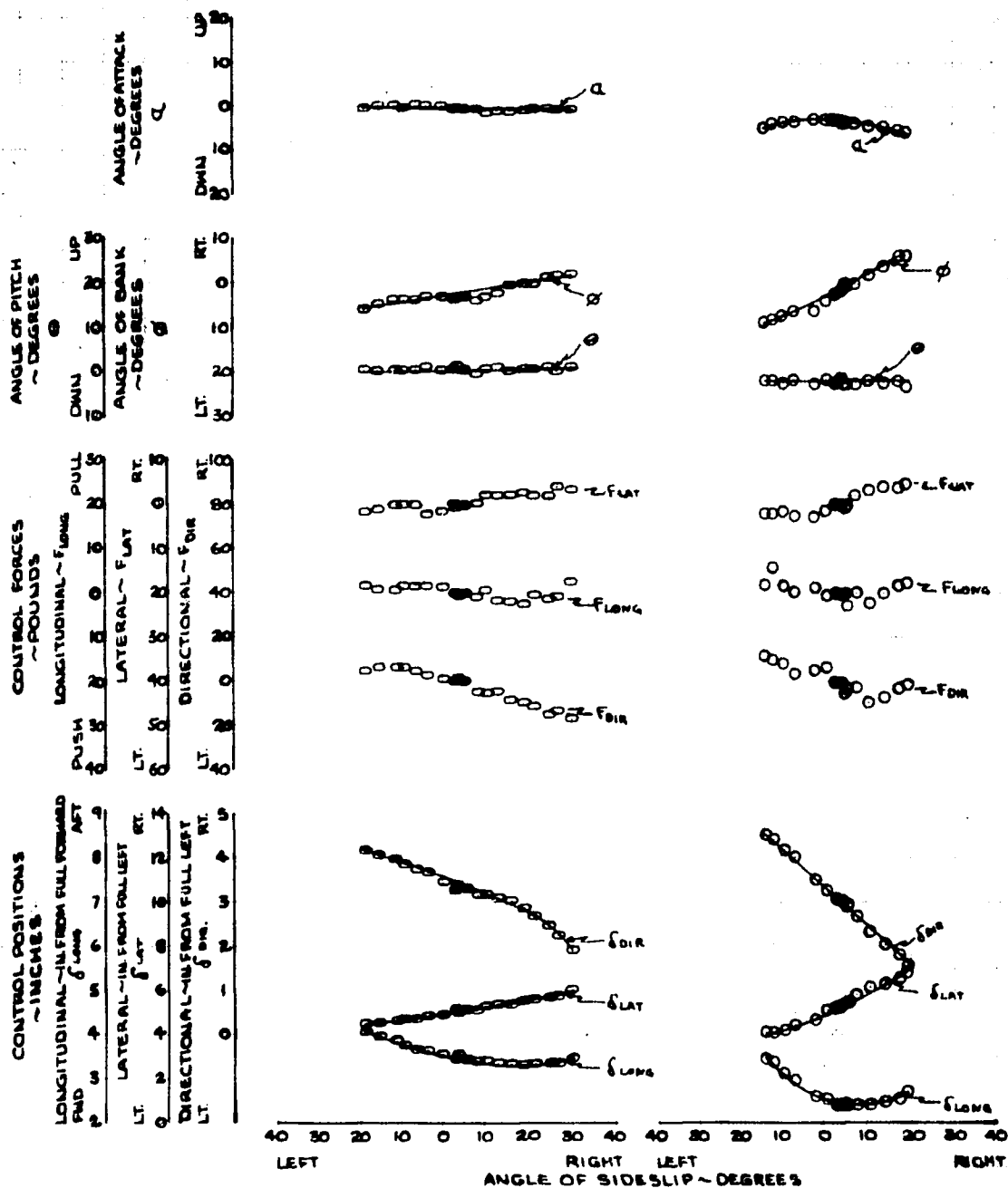


FIGURE No. 74
STATIC LATERAL DIRECTIONAL STABILITY
AN-10 USAF 15598

OUTBOARD ALTERNATE CONFIGURATION WITH BOCKET POD FAIRINGS REMOVED

SYM	MASPEED ~KCAS	AVG. ALT. H ₀ -FT.	AVG. SN. ~LB	AVG. LWB C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C _T
1	1355	2340	8485	2887(AFT)	2240	LEVEL FLX	0.006052
0	1575	2410	8470	2897(AFT)	2340	DIVE	0.004893

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK
 ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 34.7 PERCENT FROM FULL DOWN

4. XM-25 CHIN TRUST (STOWED)

5. TOTAL CONTROL POSITIONS

LONGITUDINAL - 10.08 INCHES FROM FULL FORWARD

LATERAL - 9.90 INCHES FROM FULL LEFT

DIRECTIONAL - 5.97 INCHES FROM FULL LEFT

COLLECTIONAL - 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM
 ALL CONTROL FORCE DATA

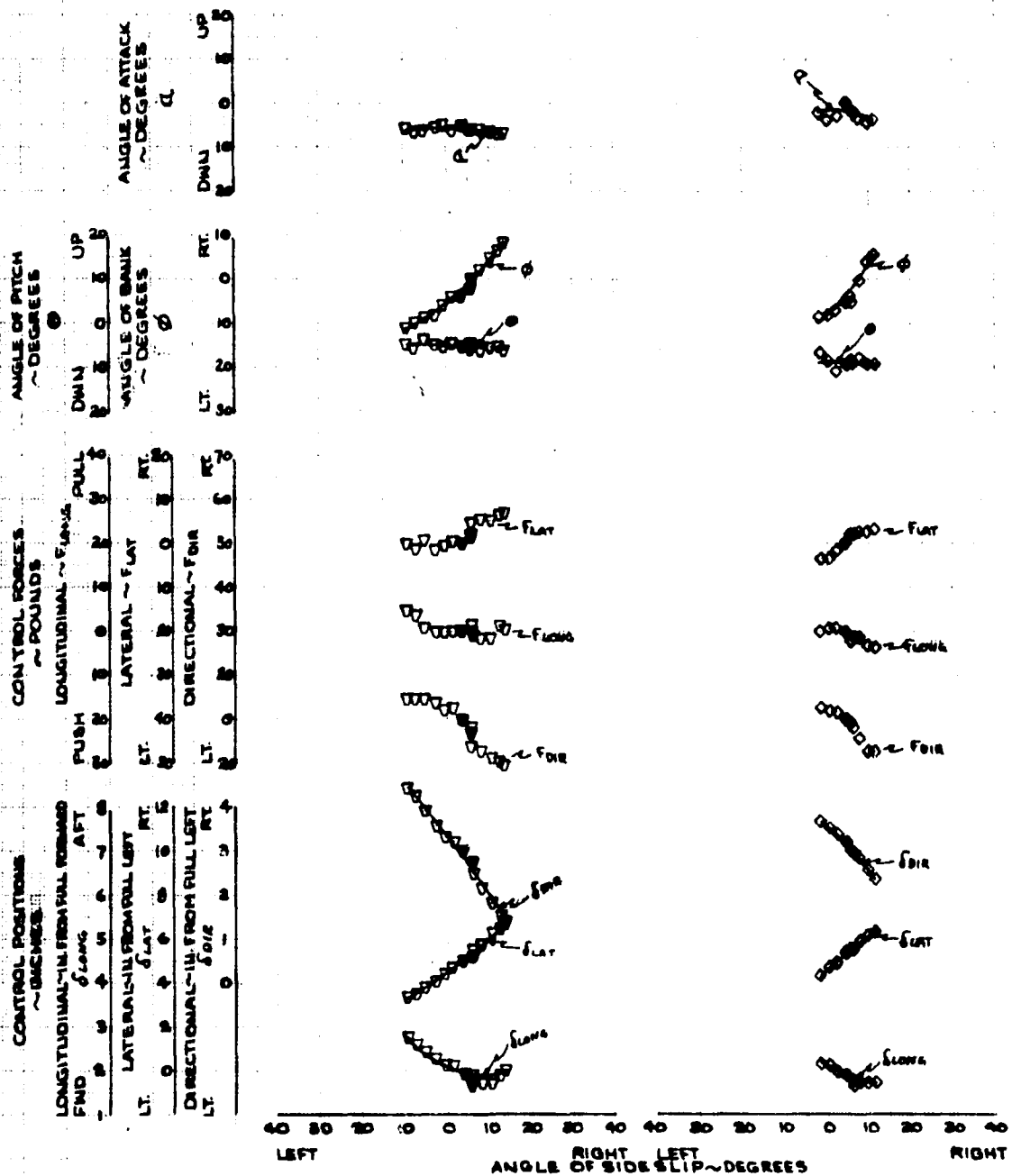


FIGURE NO 75 STATIC LATERAL DIRECTIONAL STABILITY AH-1G USAF 718698

OUTSD ALTERNATE CONFIGURATION WITH ROCKET PODFAIRINGS REMOVED

SYM	AIR SPEED ~ KCAS	AVG. ALT. H ₀ ~ FT.	AVG. G.M. ~ LB.	AVG. LONG. C.D. ~ IN.	ROTOR RPM	FLY. COND	THRUST COEFF ~ C _T
Δ	62.5	4850	2635	200.0 (997)	280.0	CLIMB AUTO	0.007251
□	64.8	4860	2645	200.4 (971)	287.0		0.007251

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK
 ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION ~ 2.1 PERCENT FROM FULL DOWN

4. XM-28 CHIN, TURBET (STONED)

5. TOTAL CONTROL DISPLACEMENT:

LONGITUDINAL: 10.08 IN. FROM FULL FORWARD

LATERAL: 9.90 IN. FROM FULL LEFT

DIRECTIONAL: 5.97 IN. FROM FULL LEFT

COLLECTIVE: 8.98 IN. FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
 FROM ALL CONTROL FORCE DATA

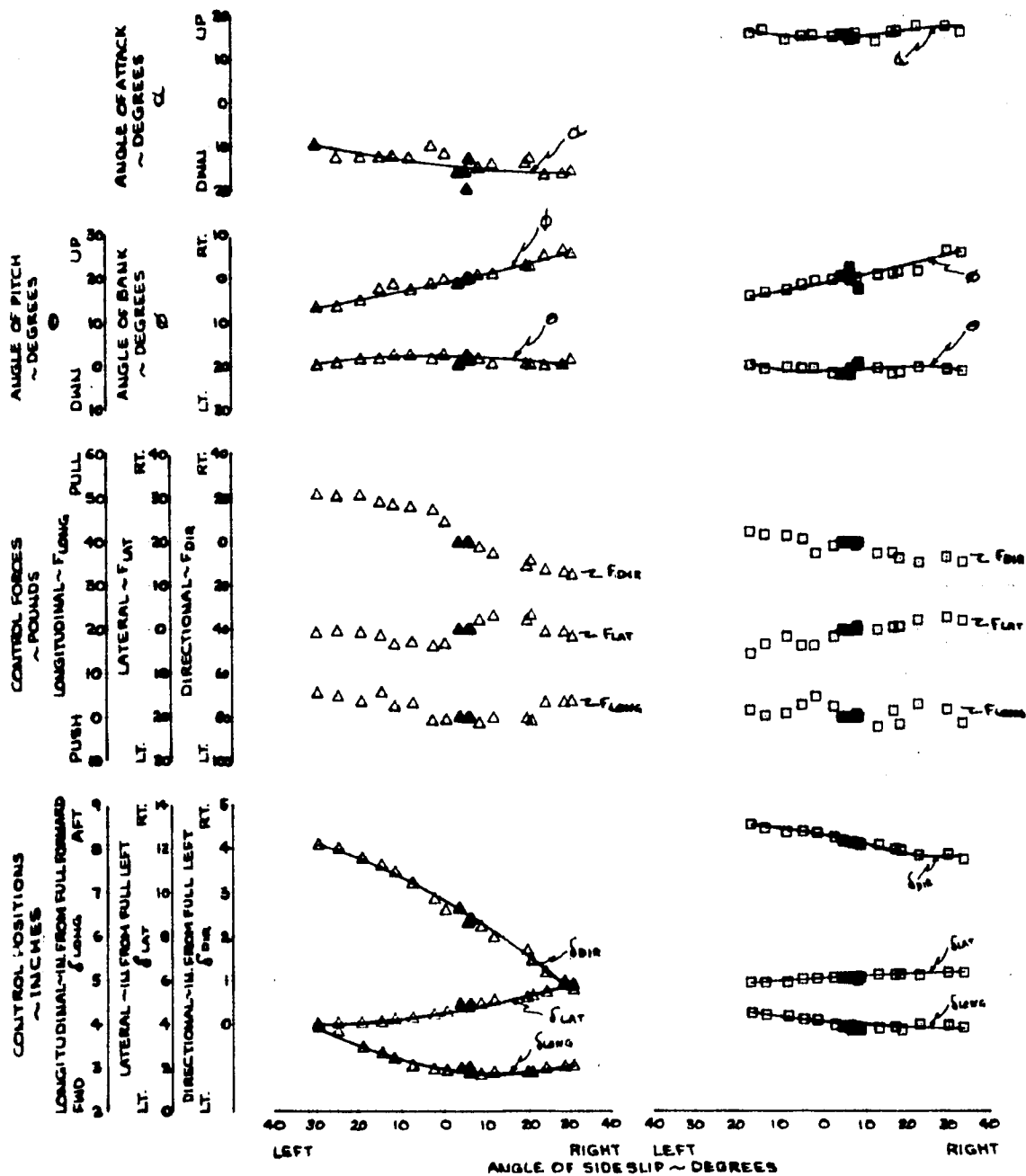


FIGURE NO. 76 STATIC LATERAL DIRECTIONAL STABILITY

AM-10 USAF 715498

HVY. SCOUT CONFIGURATION WITH ROCKET PROFAIRINGS REMOVED

SYM	AIR SPEED ~ KCAS	Avg. ALT. ~ HGT	Avg. GM ~ LB	Avg. LONG. C.G. ~ IN.	ROTOR RPM	SLT. COND.	THRUST COEFF. ~ C _T
00	62.0	2520	2445	222.5 (ACT)	2250	LEVEL FLT.	0.000996
00	102.5	2540	2510	222.5 (ACT)	2250	LEVEL FLT.	0.003424

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 25% PERCENT FROM FULL DOWN

4. XM-28 CMM TURST (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.0 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 3.93 INCHES FROM FULL LEFT

COLLECTIVE = 0.90 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

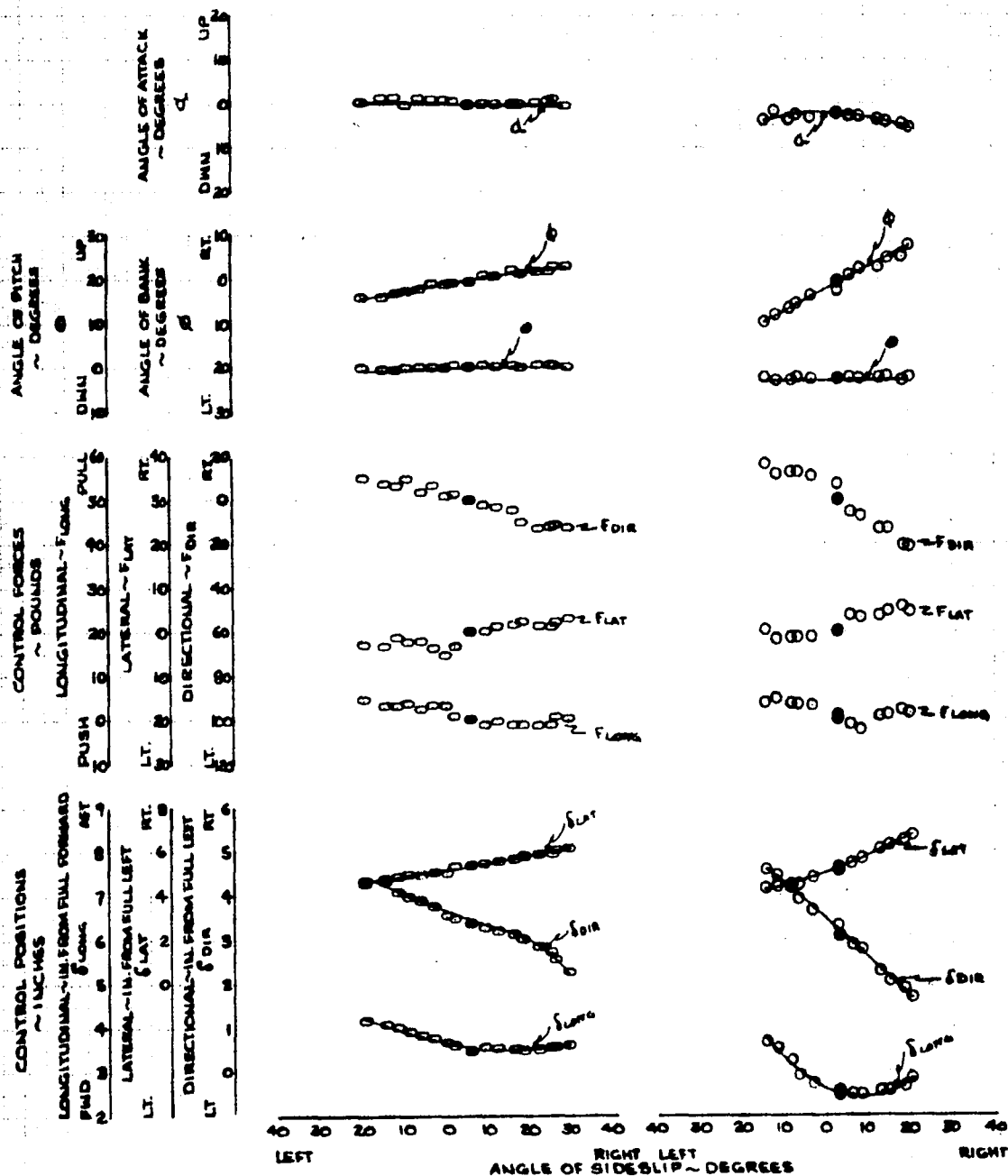


FIGURE NO. 77
 STATIC LATERAL DIRECTIONAL STABILITY
 AN-10 UBACHTI 5075

HVT SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AIR SPEED ~ KCAS	ANG. ALT ~ Hg-Ft	ANG. S.H. ~ LB	ANG. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND. THRUST COEFF.	~ C _T
1	130.0	6860	8810	200.9 (AFT)	2230	LEVEL FLT	0.005161
2	161.0	7620	8876	201.0 (AFT)	2230	DIVE	0.005174

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 38.47 PERCENT FROM FULL DOWN

4. XM-28 CANN TURBIST (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

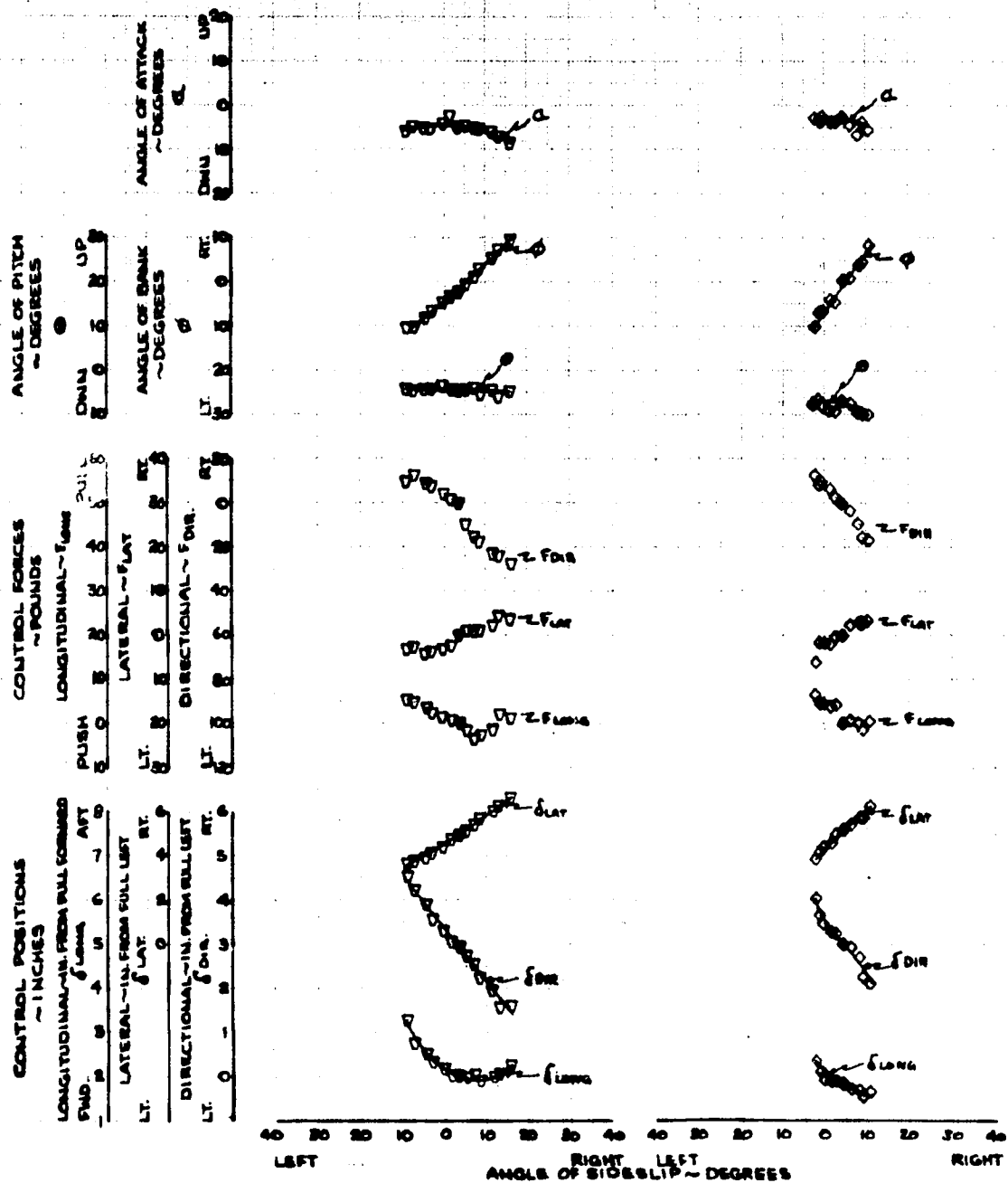


FIGURE No. 78 STATIC LATERAL DIRECTIONAL STABILITY

AM-16 USAF T15678

NAVY SCOUT CONFIGURATION WITH ROCKET POD PAIRINGS REMOVED

SYM	AIR SPEED ~ KCAS	AVG ALT ~ FT	AVG G.M. ~ LB	AVG LONG C.G. ~ IN	ROTOR RPM	FLY COND.	THRUST COEFF
A	430	6160	8800	28.0 (47)	323.0	CLOSE	0.00007
B	570	8400	8860	28.1 (47)	323.0	AUTO	0.00014

NOTES: 1. SOLID SYMBOLS DENOTE TEST POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD 0.25 PERCENT FROM FULL DOWN

3. COLLECTIVE STICK POSITION: 0.25 PERCENT FROM FULL DOWN

4. XM-28 CANNON TURRET (DOWN)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL: 1000 INCHES FROM FULL FORWARD

LATERAL: 2.90 INCHES FROM FULL LEFT

DIRECTIONAL: 5.97 INCHES FROM FULL LEFT

COLLECTIVE: 0.25 INCHES FROM FULL DOWN

6. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

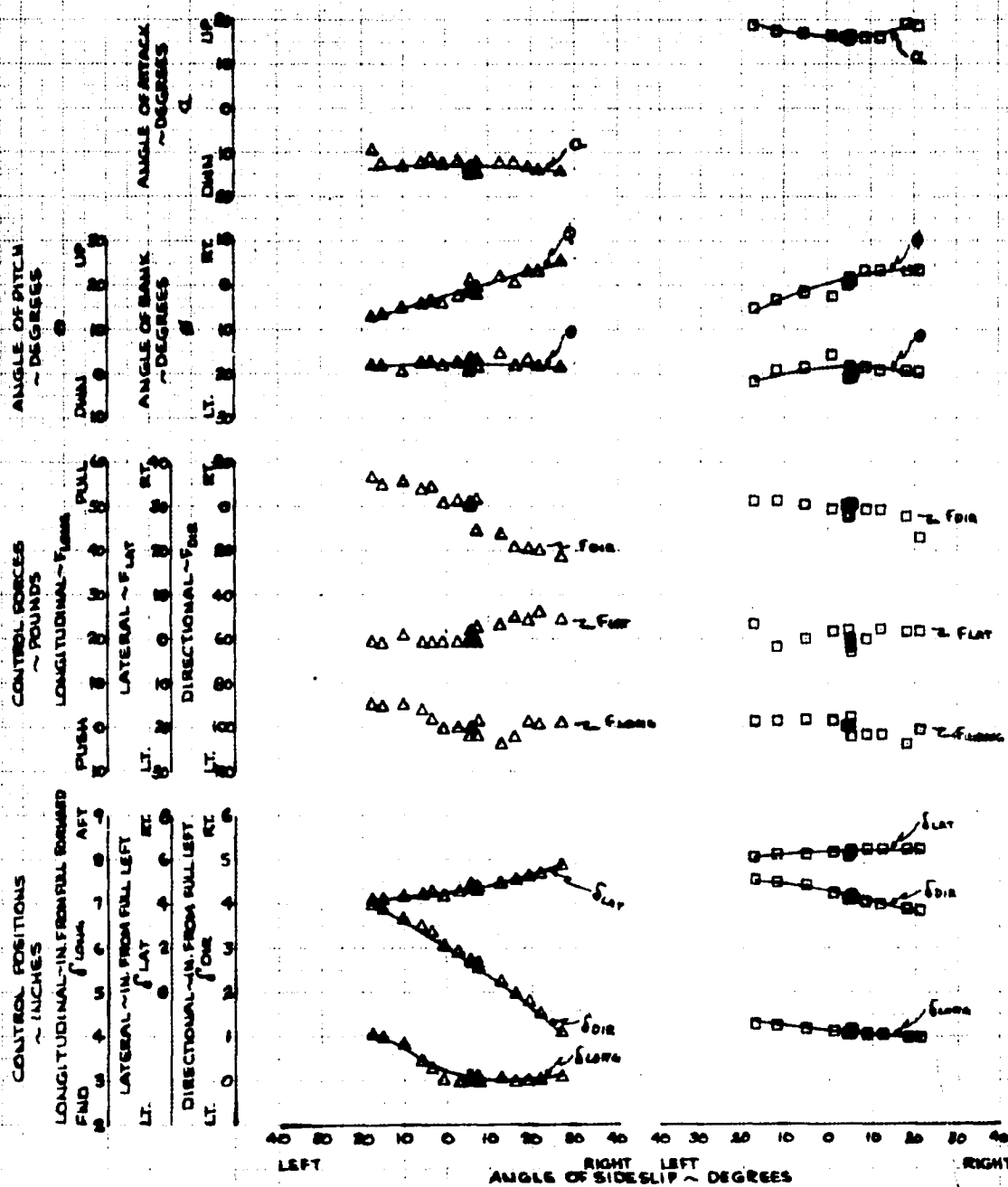


FIGURE No 79 STATIC LATERAL DIRECTIONAL STABILITY

AN-18 USAF 715695
 H.V. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ KCAS	AVG ALT. ~ FT	AVG G.A.L. ~ LB.	AVG LONG. CG ~ IN	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ CT
0	91.5	4520	8375	191.8 (FWO)	324.0	LEVEL FLT.	0.004886
0	111.5	5530	8390	191.5 (FWO)	324.0	LEVEL FLT.	0.004909

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
 2. COLLECTIVE POSITION HELD FIXED DURING TEST
 3. COLLECTIVE STICK POSITION - 38.10 PERCENT FROM FULL DOWN
 4. XM-28 CHIN TURRET (DOWNED)
 5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.03 INCHES FROM FULL FORWARD
 LATERAL - 9.90 INCHES FROM FULL LEFT
 DIRECTIONAL - 5.97 INCHES FROM FULL LEFT
 COLLECTIVE - 8.98 INCHES FROM FULL DOWN
 6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

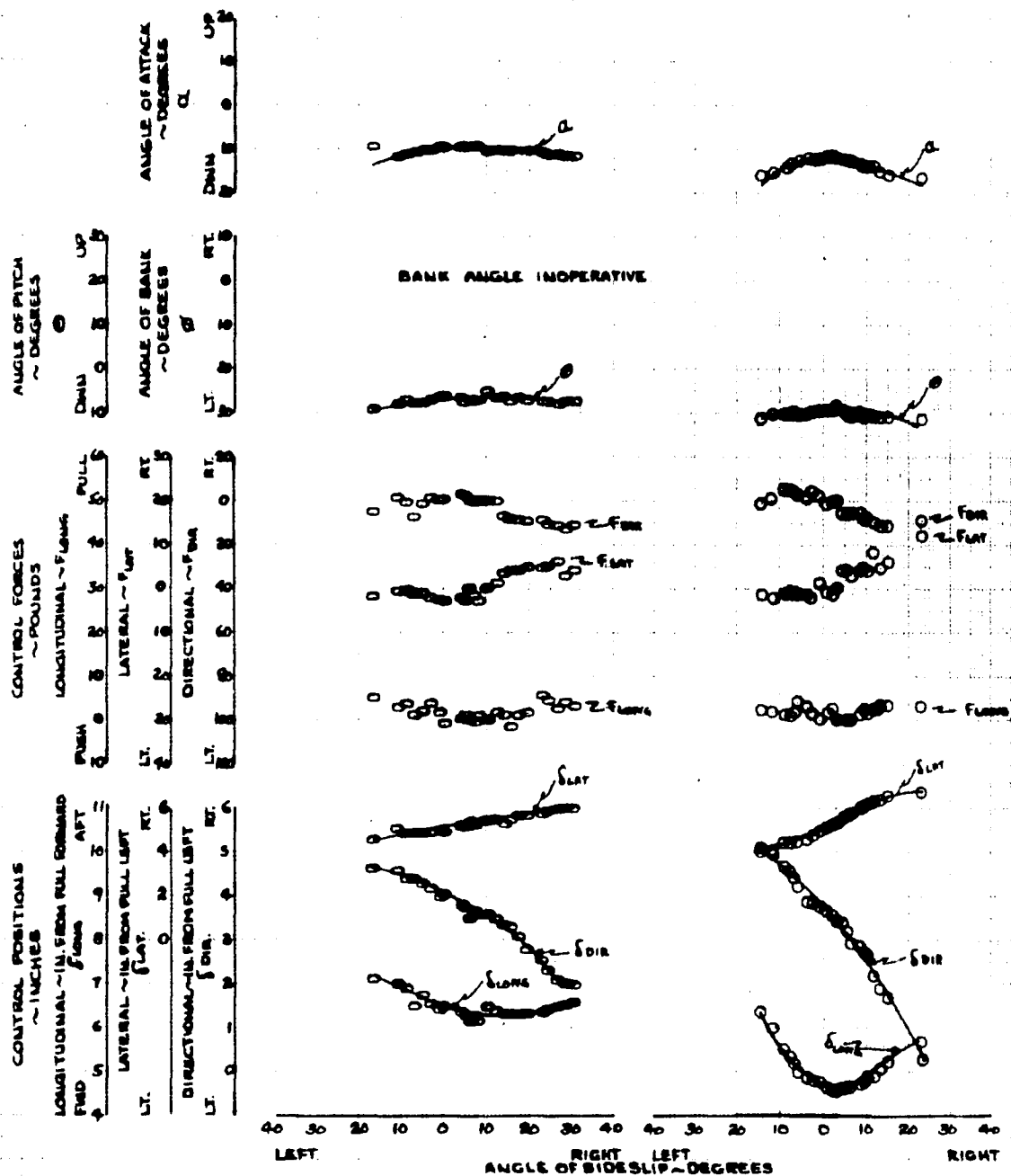


FIGURE NO. 80 STATIC LATERAL DIRECTIONAL STABILITY AM-1B USA PATCOB

PVT. MCG CONFIGURATION WITH REDNEY FOR FINDINGS REMOVED

SYM	AIR SPEED ~ KIAS	WING ALT ~ FT	WING S.M. ~ LB	WING L.W. ~ LB	WING C.G. ~ IN	WING T.W. ~ LB	FLYING THRUST ~ CF
8	125.0	4510	6000	1000 (710)	1000	1000	LEVEL FLT. 40000

- NOTES: 1. SOLID SHAPES SHOWS TEST POINT WITH AIRCRAFT'S OWN
 ATTITUDE CHORD CENTERED
 2. COLLECTIVE POSITION HELD 7000 DURING TEST
 3. COLLECTIVE BRICK POSITION - 54.6 PERCENT FROM FULL DOWN
 4. 10-20 CUM. THROTT (DOWN)
 5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD
 LATERAL - 0.00 INCHES FROM FULL LEFT
 DIRECTIONAL - 0.00 INCHES FROM FULL LEFT
 COLLECTIVE - 0.00 INCHES FROM FULL DOWN
 6. BREAK OUT SIDES HAVE BEEN ANALYTICALLY DERIVED
 FROM ALL CONTROL FORCE DATA

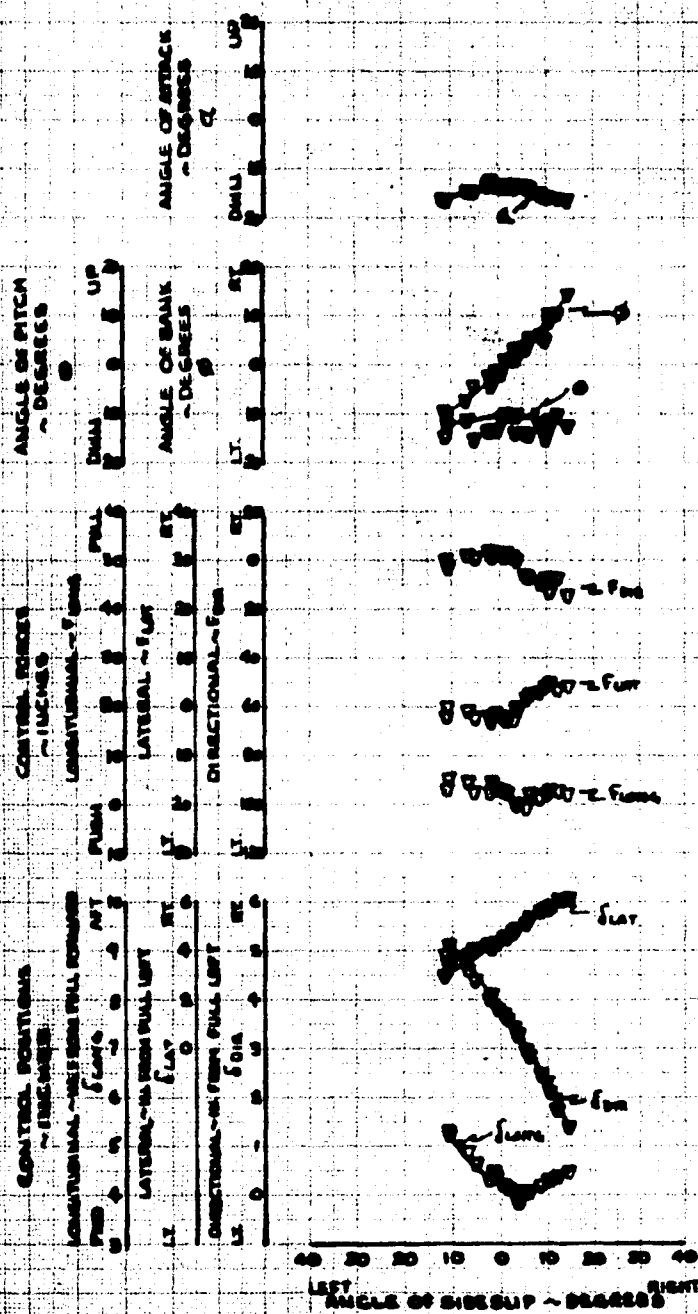
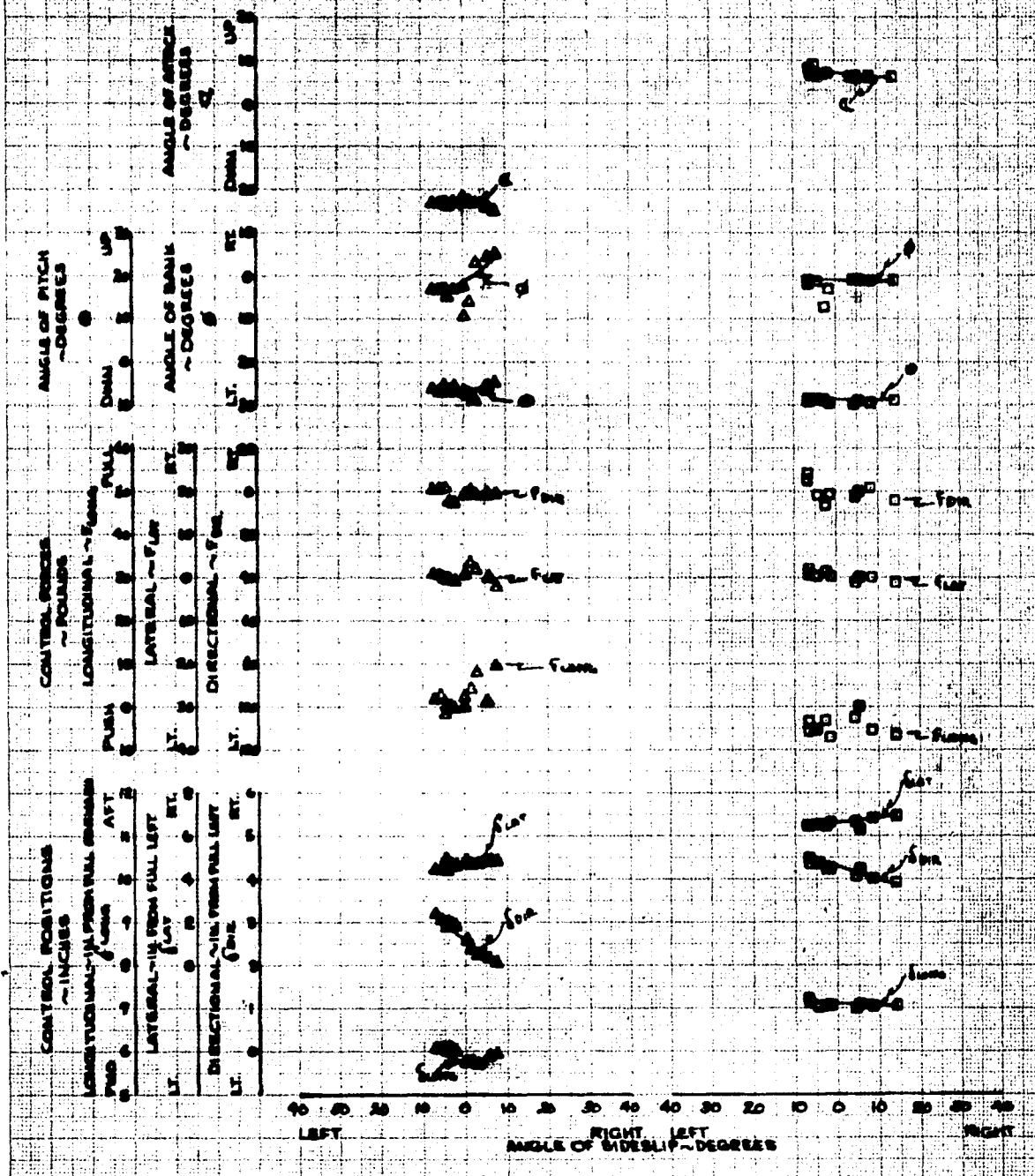


FIGURE NO. 81 STATIC LONGITUDINAL DIRECTIONAL STABILITY AN-12 USAC/15475

WY. HOS. CONSIDERATION WITH ROCKET POD FAIRINGS REMOVED

SYM	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET	APPROX. ALT. ~ FEET
▲	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5
●	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5	0-5

NOTES: 1. SOLID SYMBOLS DENOTE TEST POINT WITH AIRCRAFT BANK
 ATTITUDE BYO BALL CENTERED
 2. COLLISION POSITION HOLD-POSD DURING TEST
 3. COLLECTIVE STICK POSITION: 2.5% PERCENT FROM FULL DOWN
 4. 25% 25% BANK TURN (UPWARD)
 5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL: 15% INCHES FROM FULL FORWARD
 LATERAL: 5.4% INCHES FROM FULL LEFT
 DIRECTIONAL: 5.4% INCHES FROM FULL LEFT
 COLLECTIVE: 5.4% INCHES FROM FULL DOWN
 6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY DERIVED
 FROM ALL CONTROL FORCE DATA



NAVY HQS CONFIGURATION WITH DECK AND FANNING REMOVED

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



FIGURE NO. 83 **STATIC LATERAL DIRECTIONAL STABILITY** **AH-1G USAF 15695**

HVV HQG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~KAS	AVG. ALT. ~FT	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	MOTOR RPM	FLT. COND. THRUST COEFF. ~CY
▽	148.0	8940	7740	201.3 (AFT)	323.0	LEVEL FLT. 0.004374
◇	188.0	5730	7680	201.3 (AFT)	323.0	DIVE 0.004653

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION = 38.07 PERCENT FROM FULL DOWN

4. XM-28 CHIN TURRET (STOWED) 38.00

5. TOTAL CONTROL POSITIONS

LONGITUDINAL = 10.03 INCHES FROM FULL FORWARD

LATERAL = 9.90 INCHES FROM FULL LEFT

DIRECTIONAL = 5.97 INCHES FROM FULL LEFT

COLLECTIVE = 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

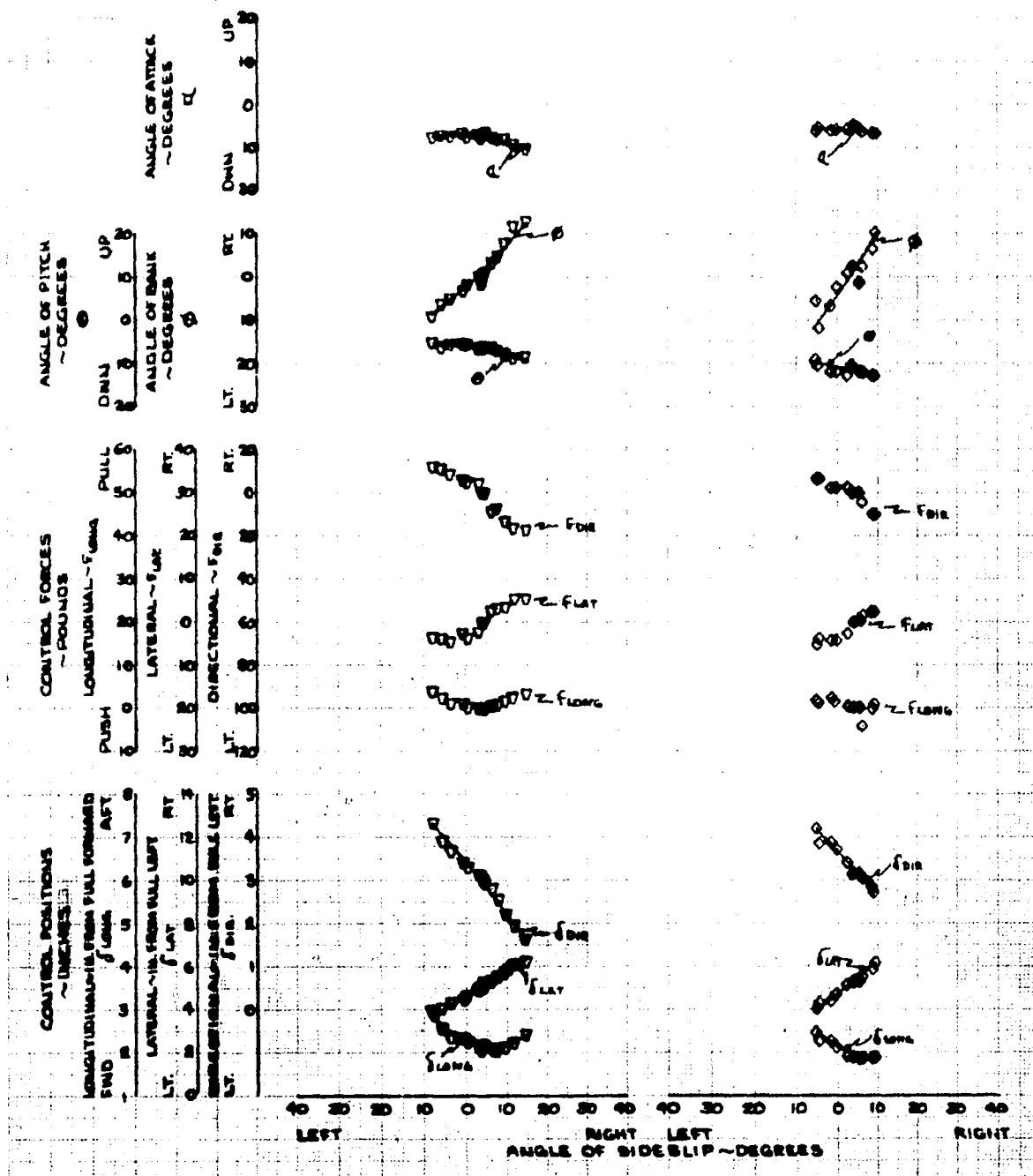


FIGURE NO. 41 STATIC LATERAL DIRECTIONAL STABILITY

AM-1B USAF 715078

HVV. NOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ KCAS	AVG. ALT. ~ Hg-FT	AVG. G.M. ~ LB	AVG. LING. C.G. ~ IN.	SEDS APM	FLT. COND.	THRUST COEFF. ~ C _T
Δ	64.5	2500	2575	284.0 (ST)	225.0	CLIMB	0.0447
□	72.5	7000	2625	284.0 (ST)	240.0	AUTOGATION	0.0512

- NOTES: 1. SOLID SYMBOLS DEMOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = 0.50 PERCENT FROM FULL DOWN
4. AM-28 CHIN TURRET (DOWN)
5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.03 IN. FROM FULL FORWARD
 LATERAL - 9.90 IN. FROM FULL LEFT
 DIRECTIONAL - 5.97 IN. FROM FULL LEFT
 COLLECTIVE - 2.98 IN. FROM FULL DOWN
6. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

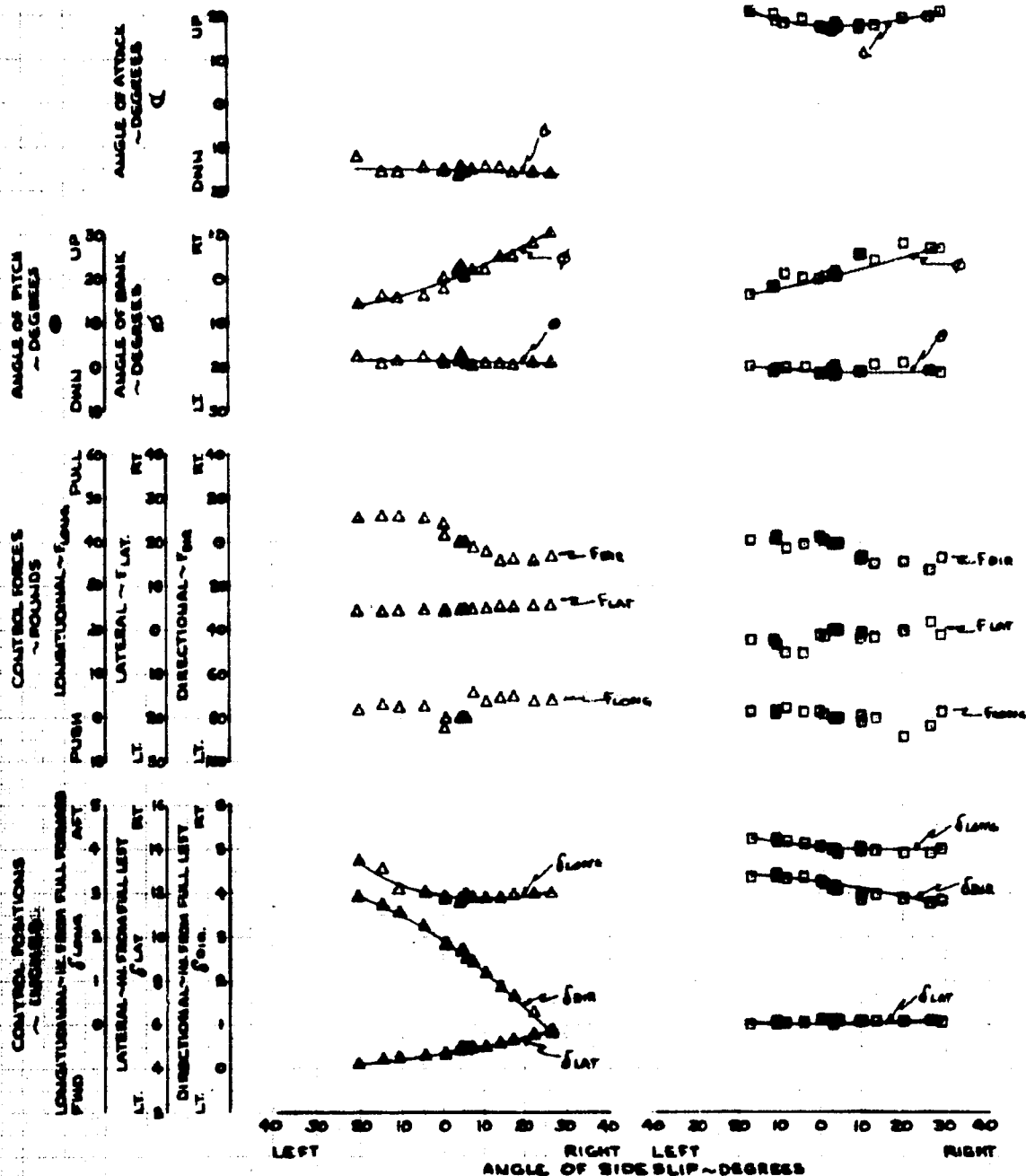


FIGURE NO. B5 STATIC LATERAL DIRECTIONAL STABILITY

AM-1G USAF T-38C
 H.V. HOG CONFIGURATION WITH ROCKET POD FINNINGS REMOVED

SYM	AIR SPEED ~ KCAS	AVG. ALT. ~ H ₀ - FT.	AVG. G.W. ~ LB.	AVG. L.W. C.G. ~ IN.	REVS ~ RPM	FLT. COND.	THRUST COEFF. ~ C _T
0	60.5	3750	8710	300.7 (0.7)	322.5	LEVEL RT.	0.00416
0	105.5	4750	8745	300.0 (0.7)	325.0	LEVEL FLT.	0.004987

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK
 ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION - 25.0 PERCENT FROM FULL DOWN
4. XM-28 CHIN TURRET (STOWED)
5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.05 IN. FROM FULL FORWARD
 LATERAL - 9.90 IN. FROM FULL LEFT
 DIRECTIONAL - 5.97 IN. FROM FULL LEFT
 COLLECTIVE - 0.98 IN. FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
 FROM ALL CONTROL FORCE DATA

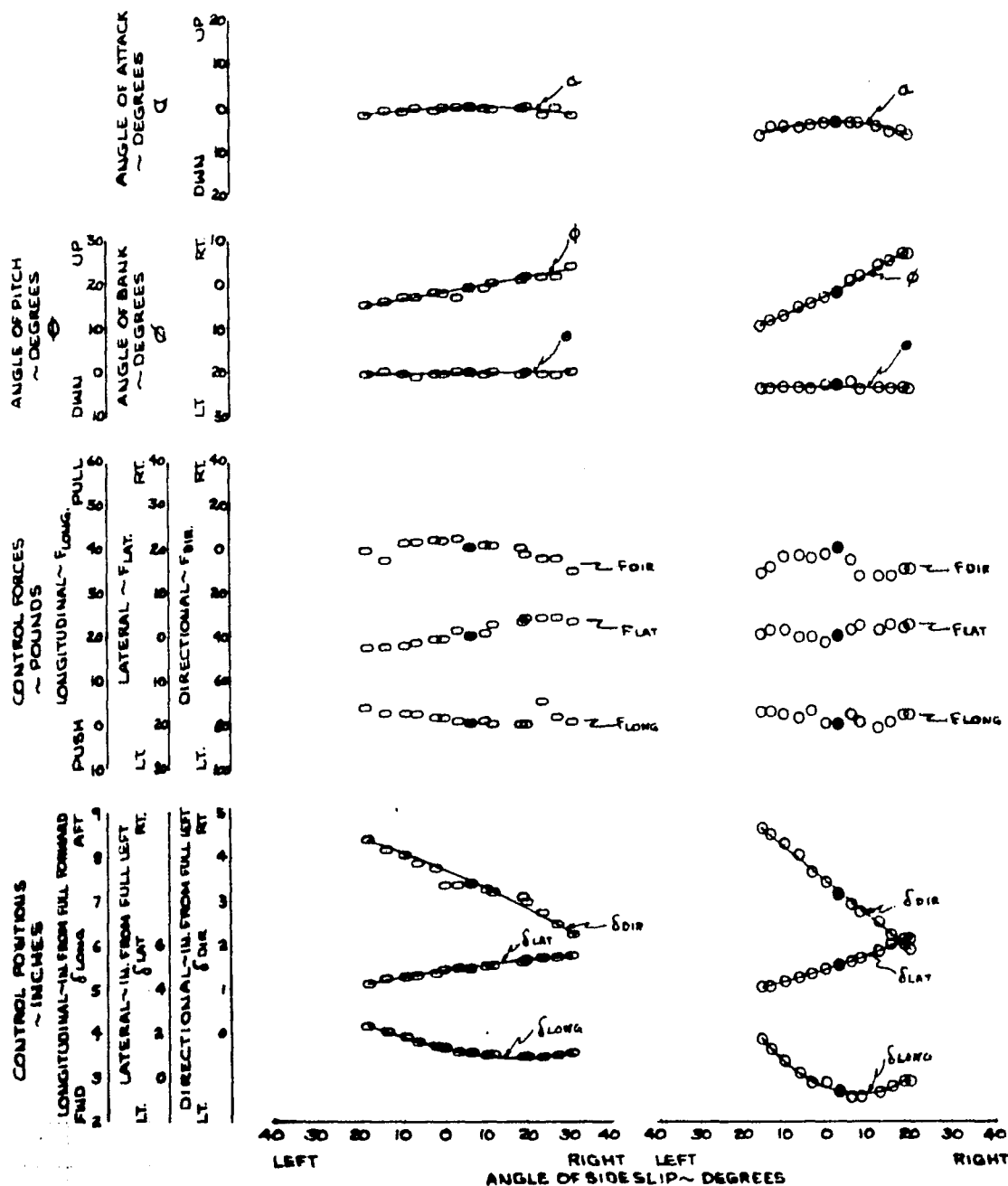


FIGURE NO. 86 STATIC LATERAL DIRECTIONAL STABILITY

AN-10 USA 6715695
 HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED	AVE. ALT.	AVE. SM.	AVE. LON.	ROTOR	FLT. COND.	THRUST COEFF.
0	~KCAS	~FT	~LB	~IN.	RPM	~CT	~CT
●	120.5	5440	8390	200.8(AFT)	324.0	LEVEL FLX	0.089408
●	151.5	6340	8150	200.9(AFT)	324.0	DIVE	0.089412

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION - 39.60 PERCENT FROM FULL DOWN

4. KM-28 CHIN THRUST (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL 10.0 INCHES FROM FULL FORWARD

LATERAL 9.95 INCHES FROM FULL LEFT

DIRECTIONAL 8.97 INCHES FROM FULL LEFT

COLLECTIVE 8.95 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

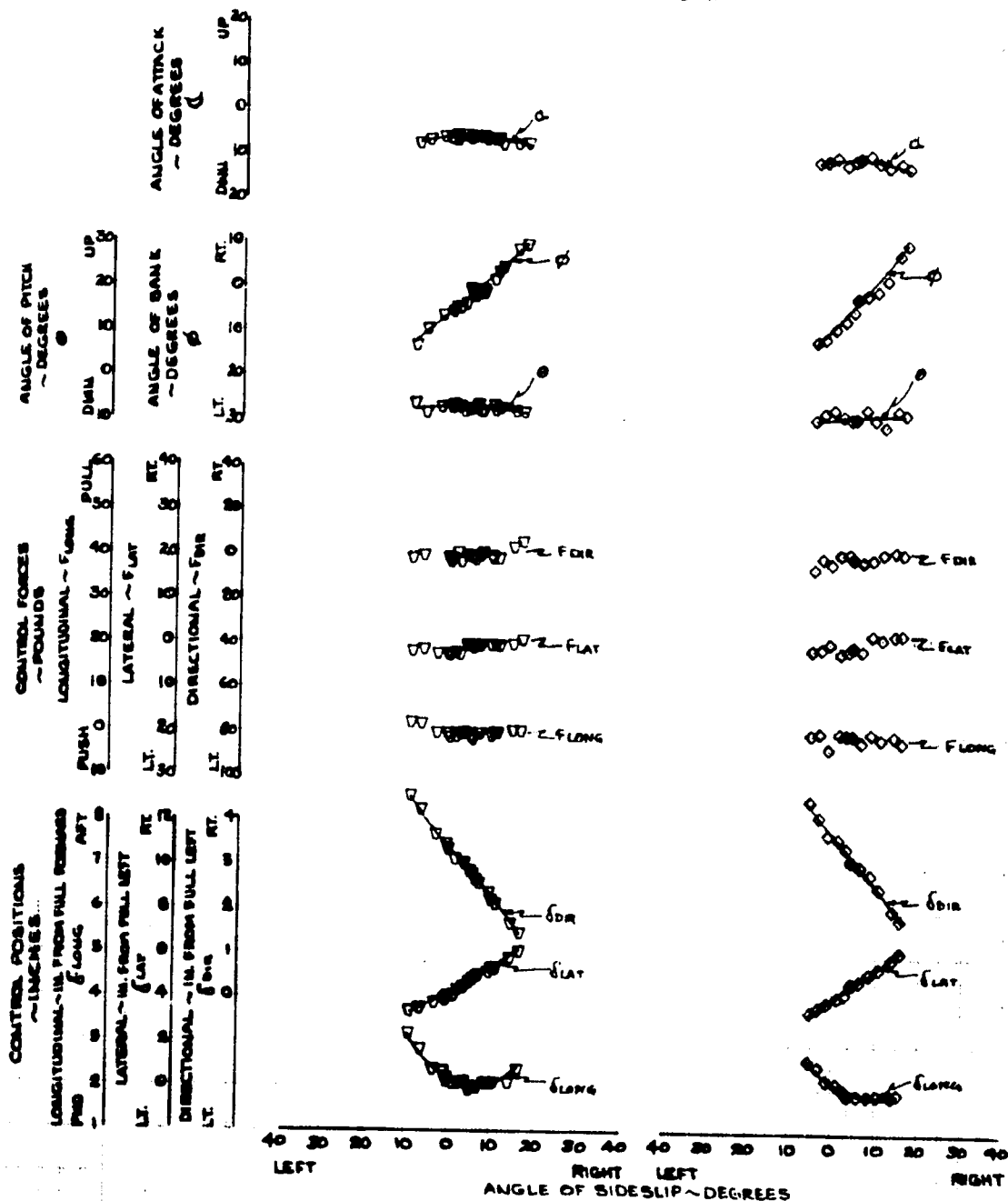


FIGURE No. 87 STATIC LATERAL DIRECTIONAL STABILITY AH-1G USAF 15645

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
 JAN 57

SYM	AIR SPEED ~ KCAS	AVG. ALT. H ₀ ~ FT.	AVG. G.N. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLY COND.	THRUST COEFF. ~ C _T
▲	65.0	7500	8000	200.9 (AFT)	318.0	CLIMB	0.405161
■	67.0	8700	7900	200.9 (AFT)	328.0	AUTORESTATION	0.405089

NOTES: 1. SOLID SYMBOLS DEMOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION - 85% PERCENT FROM FULL DOWN

4. KM-28 CHIN TRUST (STRESS)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL: 10.0 INCHES FROM FULL FORWARD

LATERAL: 9.90 INCHES FROM FULL LEFT

DIRECTIONAL: 8.97 INCHES FROM FULL LEFT

COLLECTIVE: 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

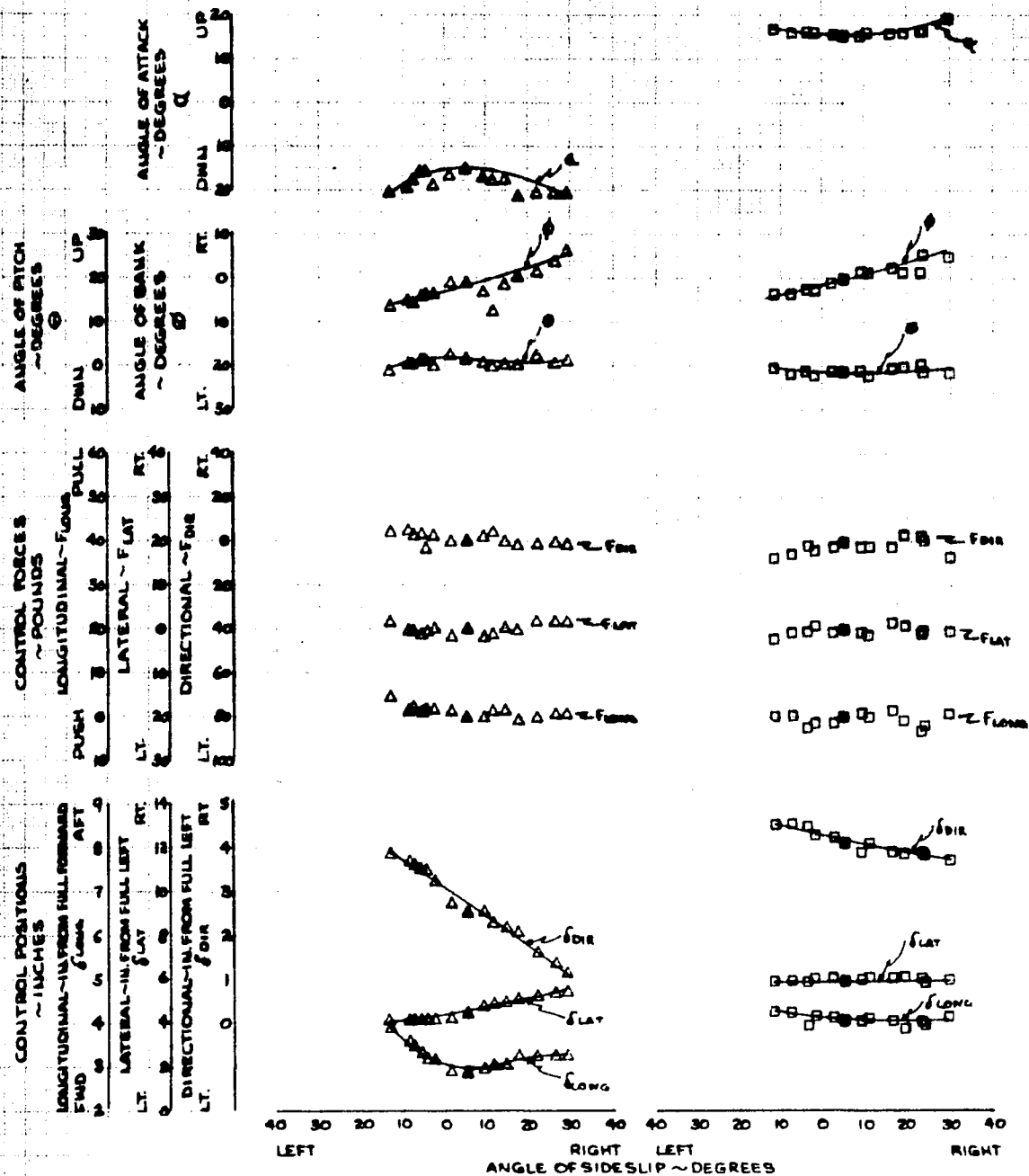


FIGURE NO. 88
STATIC LATERAL DIRECTIONAL STABILITY
AN-10 USAF 715698

MVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	ALIGNED ~DEG	AVE. ALT ~FT	AVE. CH. ~LB	AVE. LONG. C.G. ~IN.	ROTOR RPM	FLY COND.	THRUST COEFF. ~C _T
●	68.4	4280	9140	108.8 (AFT)	2815	LEVEL FL.	0.000000
○	107.0	4650	9620	109.9 (AFT)	3033	LEVEL FL.	0.000000

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK
 ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE STICK POSITION ~ 25 PERCENT FROM FULL DOWN

4. 4-IN-30 CMN TURRET (STOWED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL ~ 10.88 INCHES FROM FULL FORWARD

LATERAL ~ 9.90 INCHES FROM FULL LEFT

DIRECTIONAL ~ 5.83 INCHES FROM FULL LEFT

COLLECTIVE ~ 8.98 INCHES FROM FULL DOWN

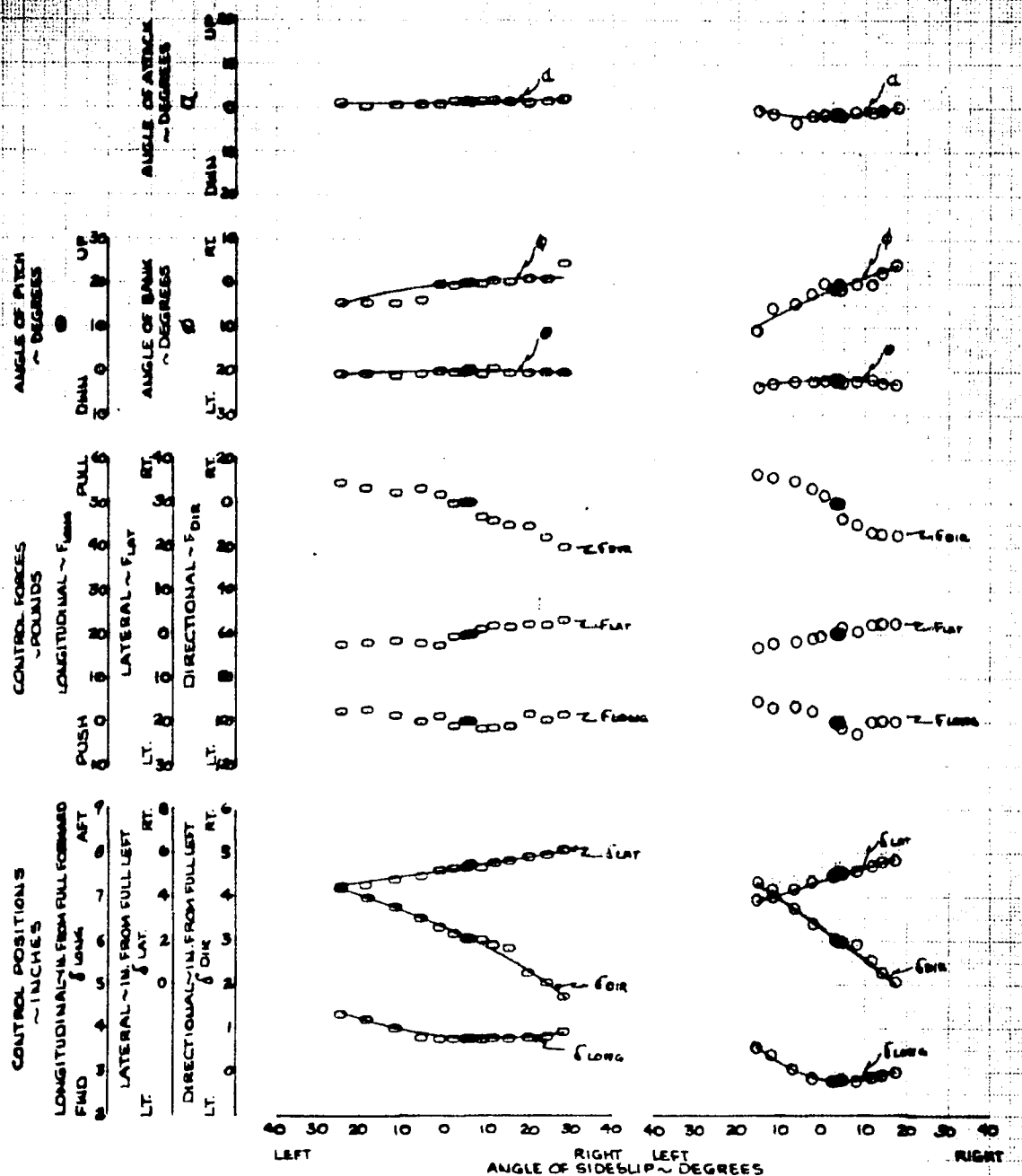


FIGURE No. 97 Basic Lateral Directional Stability

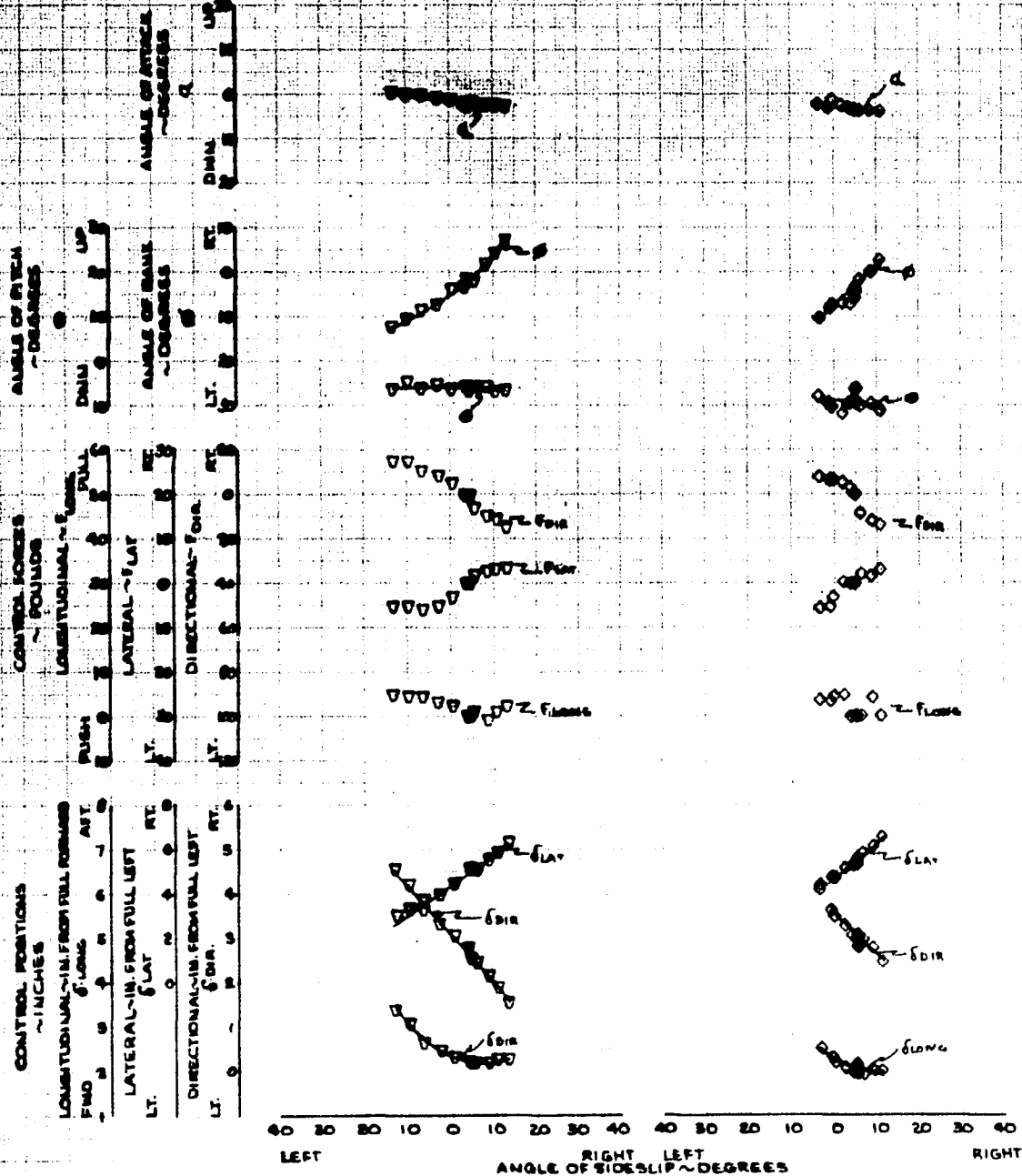
AM-19 USAF 15499

MYT NOS COMPENSATION WITH POCKET FOR FAIRINGS REMOVED
 (See Figure No. 96)

WMA	ASPECT	AS. ALT	AS. SA	AS. LONG	RTOR	ALZ. COND.	THRUST COEFF.
~KCAL	~KCAL	~KCAL	~KCAL	~KCAL	~KCAL	~KCAL	~KCAL
175.0	175.0	175.0	175.0	175.0	175.0	175.0	175.0
175.0	175.0	175.0	175.0	175.0	175.0	175.0	175.0

INTERPOLATED SYMBOLS DENOTE TURN POINT WITH AIRCRAFT'S BANK
 ATTITUDE GYRO BALL CENTERED

- 2. CONTROL STICK POSITION WIND FIELD DURING TEST
- 3. CONTROL STICK POSITION - 100 PERCENT FROM FULL DOWN
- 4. IN-30 CHN TIGHT (STANDARD)
- 5. TOTAL CONTROL DISPLACEMENT
- LONGITUDINAL = 10.00 INCHES FROM FULL FORWARD
- LATERAL = 10.00 INCHES FROM FULL LEFT
- DIRECTIONAL = 5.00 INCHES FROM FULL LEFT
- COLLECTIVE = 0.90 INCHES FROM FULL DOWN
- 6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



100-443887-100

ATTITUDE ON GOLF COURSE

2 COLLECTING INFORMATION FROM THE PUBLIC

A COLLECTOR'S PRICE LISTING

4-22-68 CAR WASH (P) (U)

2 TOTAL CRYSTAL DISPLACEMENT

LAPARAL - 2-20-68 - 1000 P.M. LEFT

SECRET

COLLECTIVE - 6-12-1968 FROM TEL AVIV

4. BREAK OUT POINTS HAVE BEEN ANALYTICALLY MONITORED

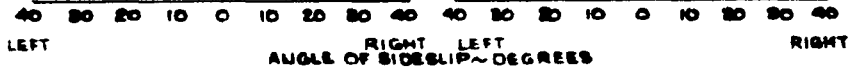


FIGURE NO. 91 STATIC LATERAL DIRECTIONAL STABILITY

AH-1G USA 6715695
 HUY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ KCAS	AVG. ALT. ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. Rotor C.G. ~ IN.	FLT. COND. THRUST COEFF. ~ CT
0	60.0	14560	8965	200.7 (AFT)	324.0
0	63.0	14280	8965	200.8 (AFT)	324.0

NOTES: 1. SOLID SYMBOLS DEMOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST
 3. COLLECTIVE STICK POSITION - $\frac{115}{100}$ PERCENT FROM FULL DOWN
 4. KM-20 CHAN TURBOSTART (STOWED)
 5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.0 INCHES FROM FULL FORWARD
 LATERAL - 9.90 INCHES FROM FULL LEFT
 DIRECTIONAL - 8.97 INCHES FROM FULL LEFT
 COLLECTIVE - 8.96 INCHES FROM FULL DOWN
- △ BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA

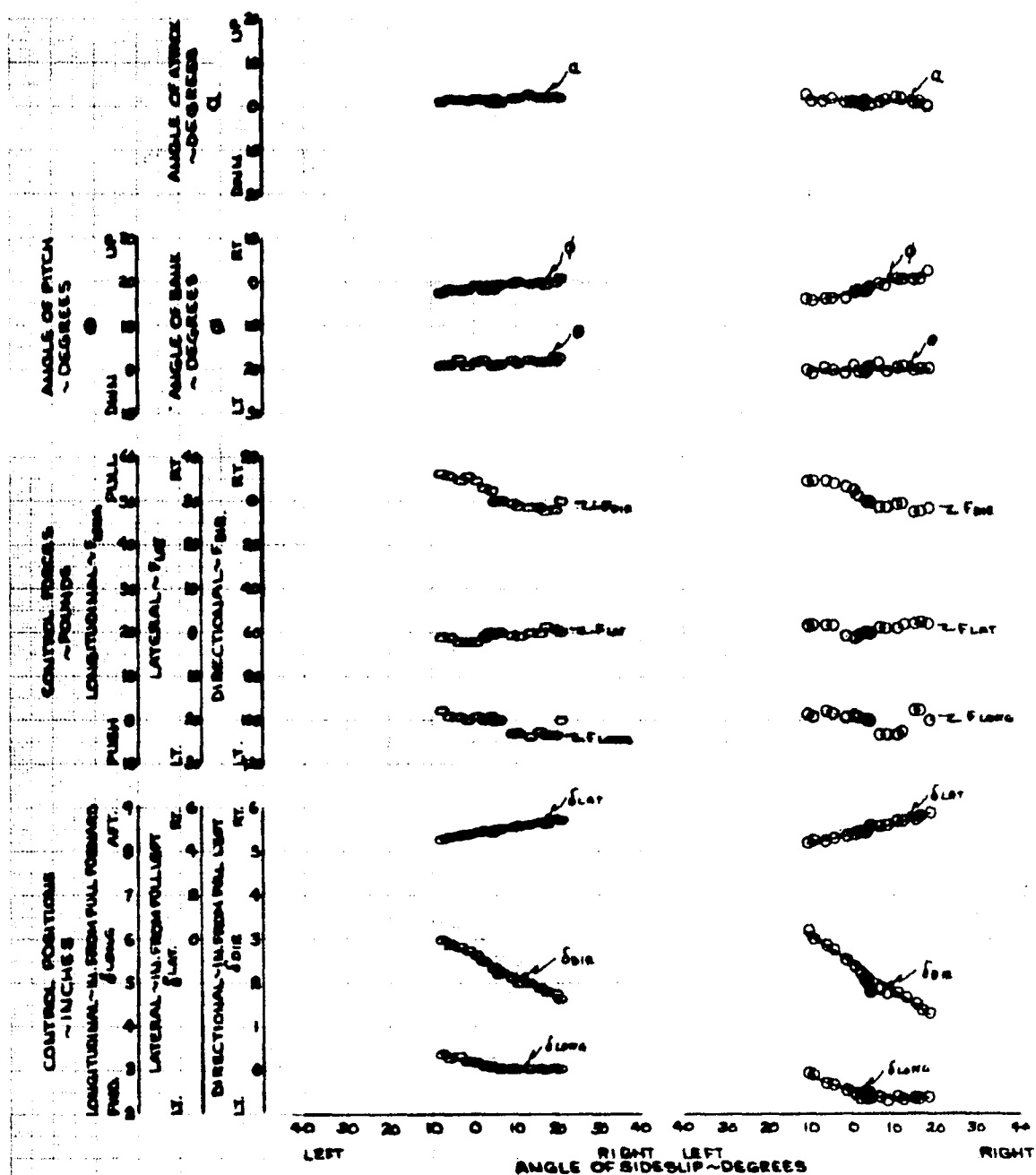


FIGURE No. 92 STATIC LATERAL DIRECTIONAL STABILITY AH-1G USAF 15808

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ KAS	Avg. ALT. H ₀ ~ FT.	Avg. S.M. ~ LB.	Avg. LONG. C.G. ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C _T
7	181.0	14070	8785	208.6 (IPT)	324.0	LEVEL ROT.	0.026000

NOTES: 1. SOLID SYMBOLS DEMONSTRATE POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED

2. COLLECTIVE POSITION HELD FIXED DURING TEST

3. COLLECTIVE BRICK POSITION = 27.7 PERCENT FROM FULL DOWN

4. XM-28 CANN TURRET (DOWNED)

5. TOTAL CONTROL DISPLACEMENT

LONGITUDINAL: 10.03 INCHES FROM FULL FORWARD

LATERAL: 9.90 INCHES FROM FULL LEFT

DIRECTIONAL: 8.97 INCHES FROM FULL LEFT

COLLECTIVE: 8.98 INCHES FROM FULL DOWN

6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE AREA

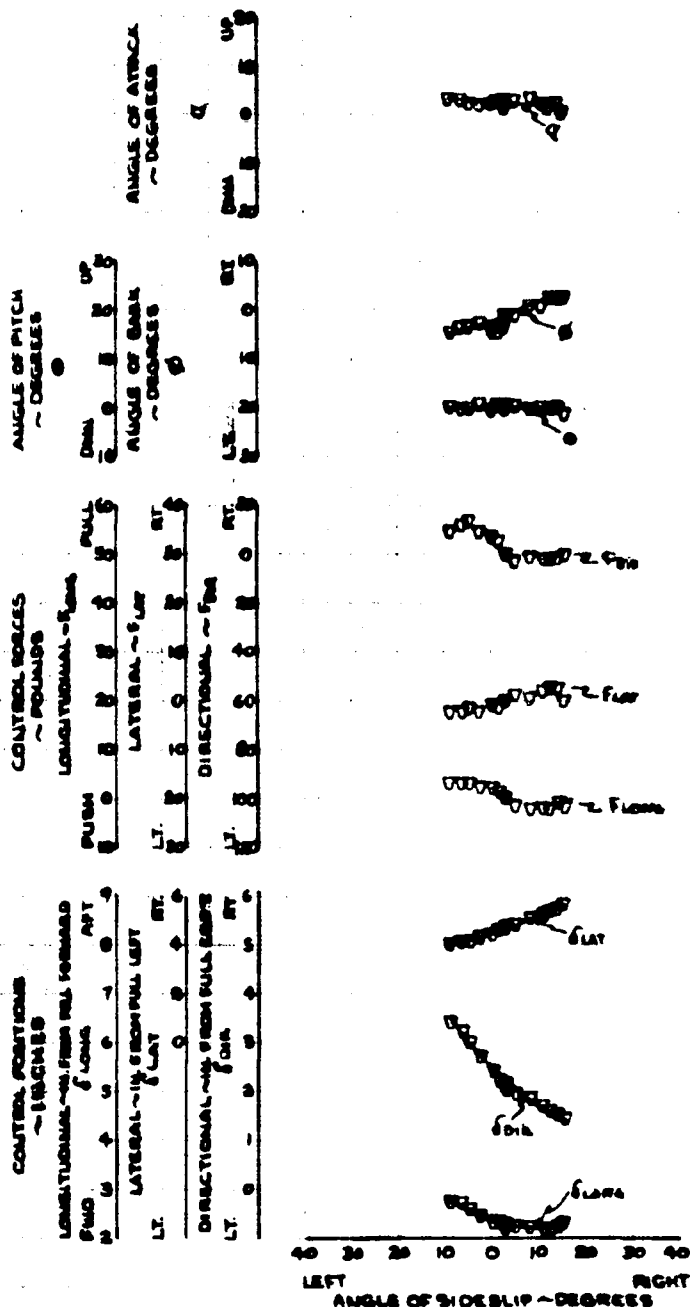
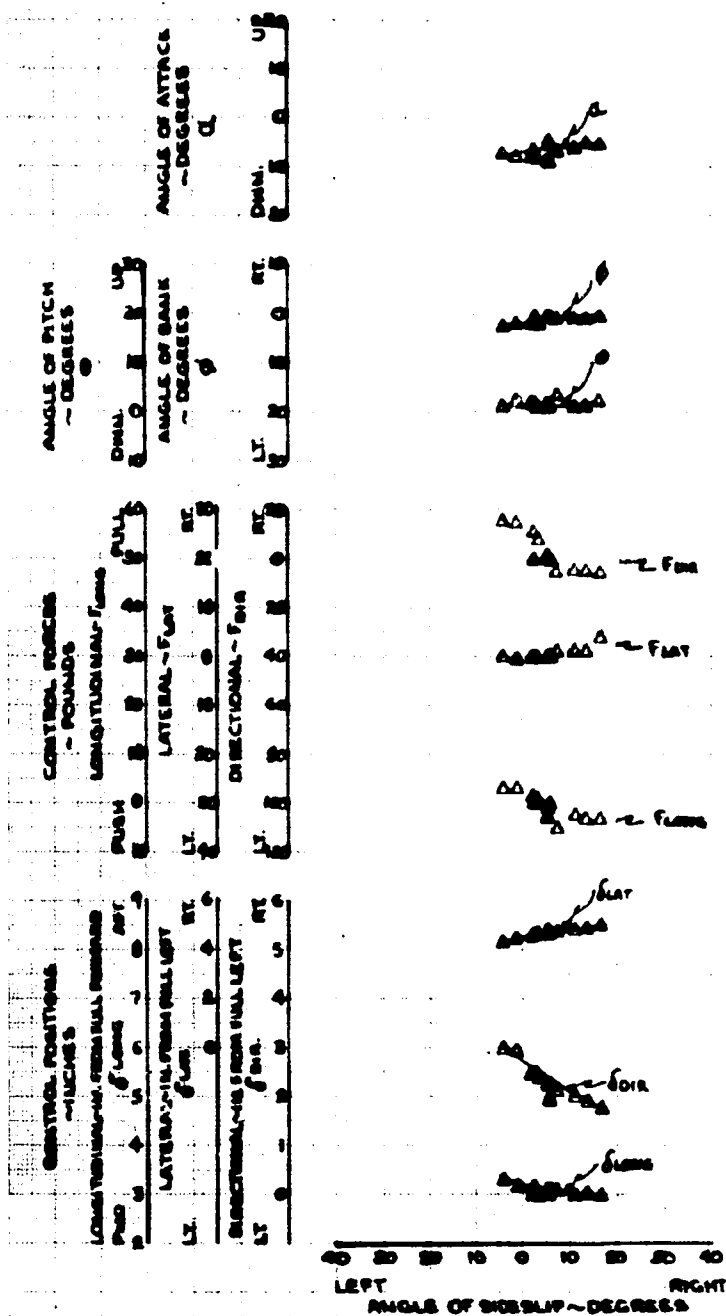


FIGURE No. 93 STATIC LATERAL DIRECTIONAL STABILITY AH-1G USAF 615347

WV. HQS CONFIGURATION WITH ROCKET PODS REMOVED
 (WTS (NET))

SYM	ALTITUDE ~KIAS	ANG. ALT. ~FT.	ANG. G.W. ~LB.	ANG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~C _T
A	550	15650	6308	288.7 (AFT)	3240	CLNRB	0.006698

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT'S BANK ATTITUDE GYRO BALL CENTERED
 2. COLLECTIVE POSITION HELD FIXED DURING TEST
 3. COLLECTIVE STICK POSITION - 88.8 PERCENT FROM FULL DOWN
 4. XM-28 CANN TURRET (STOWED)
 5. TOTAL CONTROL DISPLACEMENT
 LONGITUDINAL - 10.03 INCHES FROM FULL FORWARD
 LATERAL - 9.90 INCHES FROM FULL LEFT
 DIRECTIONAL - 5.97 INCHES FROM FULL LEFT
 COLLECTIVE - 8.98 INCHES FROM FULL DOWN
 6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED FROM ALL CONTROL FORCE DATA



CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT BANK
ATTITUDE GYRO BALL CENTERED
2. COLLECTIVE POSITION HELD FIXED DURING TEST
3. COLLECTIVE STICK POSITION = 30.8 PERCENT FROM FULL DOWN
4. 8M-20 CHIN TURRET (STOWED)
5. TOTAL CONTROL DISPLACEMENT:
LONGITUDINAL = 9.07 IN. FROM FULL FORWARD
LATERAL = 10.0 IN. FROM FULL LEFT
DIRECTIONAL = 7.07 IN. FROM FULL LEFT
COLLECTIVE = 9.80 IN. FROM FULL DOWN
6. BREAK OUT FORCES HAVE BEEN ANALYTICALLY REMOVED
FROM ALL CONTROL FORCE DATA



FIGURE No. 95 Static Lateral Directional Stability AN-18 USA 241841

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM	AIR SPEED	ANG. OF AT	ANG. OF S	ANG. LONG. STICK	ROT. RATE	FLY COND.	THRUST COEFF.
	145.0	0.00	0.00	0.00 (UP)	0.00	LEVEL FLT	0.00000
	170.0	0.00	0.00	0.00 (UP)	0.00	DIVE	0.00000

- NOTES: 1. SOLID SYMBOLS DENOTE TRIM POINT WITH AIRCRAFT BANK
 ATTITUDE GYRO BALL CENTERED
 2. COLLECTIVE POSITION HELD FIXED DURING TEST
 3. COLLECTIVE STICK POSITION - 44.0 PERCENT FROM FULL DOWN
 4. IN-20 CMM TURRET (STOWED)
 5. TOTAL CONTROL DISPLACEMENT:
 LONGITUDINAL - 9.07 IN. FROM FULL FORWARD
 LATERAL - 10.00 IN. FROM FULL LEFT
 DIRECTIONAL - 7.07 IN. FROM FULL LEFT
 COLLECTIVE - 9.30 IN. FROM FULL DOWN
 6. BREAKOUT FORCES HAVE BEEN ANALYTICALLY REMOVED
 FROM ALL CONTROL FORCE DATA

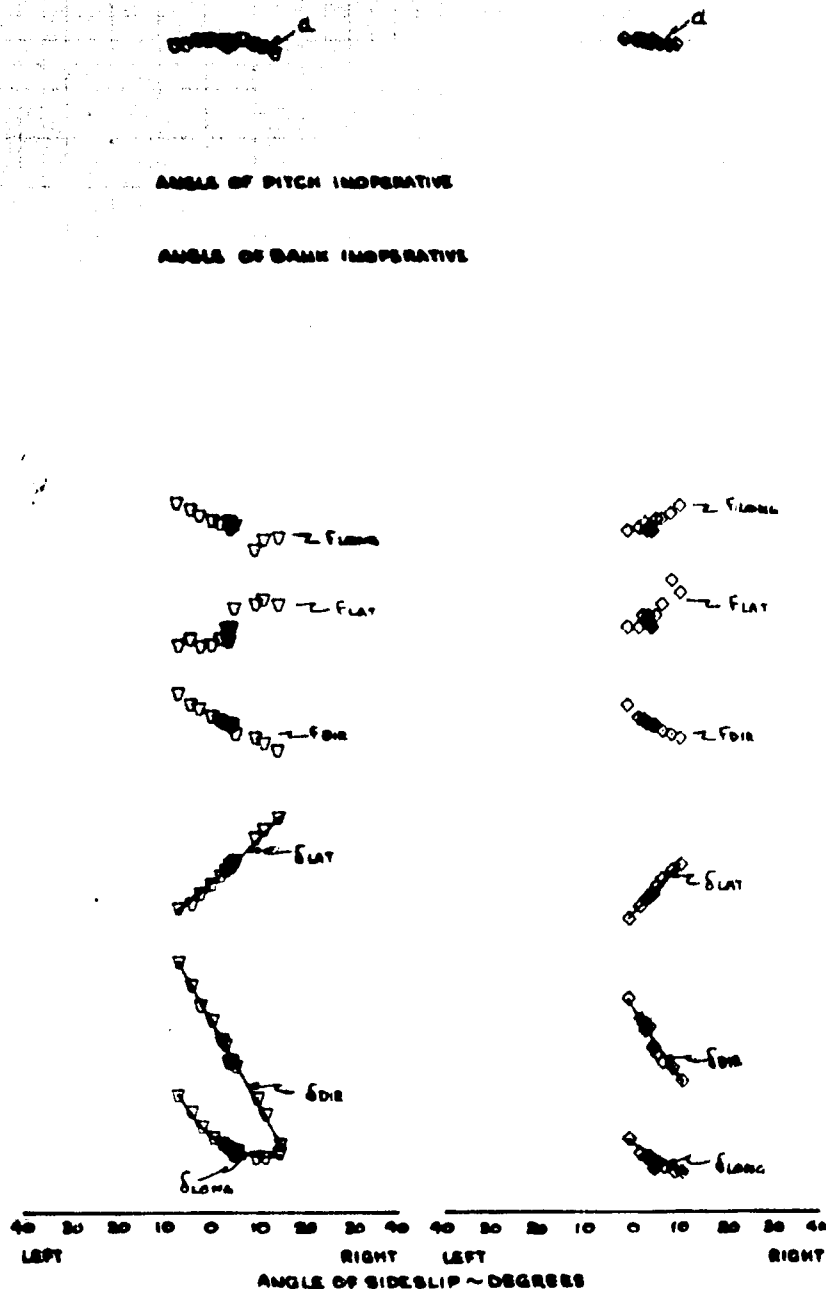
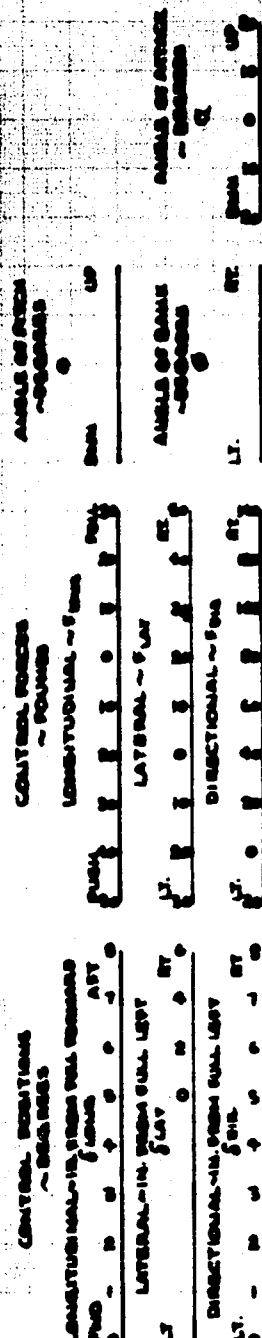


FIGURE No. 96
IGE HOVERING IN WIND
FOR A TEN PERCENT DIRECTIONAL CONTROL MARGIN
 AH-1G USA #615247
 T53-L-18 #LE14001
 SKID HEIGHT - 7 FEET

- NOTES: 1. POINTS DERIVED FROM NO. 91 THROUGH 100 APP. VII
 2. WIND VELOCITY PRESENTED FOR CRITICAL WIND AZIMUTH
 3. SEVEN FOOT SKID HEIGHT REPRESENTS MOST CRITICAL CONDITION.
 4. FULL LEFT DIRECTIONAL CONTROL - 19° TAIL ROTOR BLADE ANGLE
 5. 10 PERCENT DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED HOVER
 6. YAW SCAS OFF
 7. STANDARD DAY

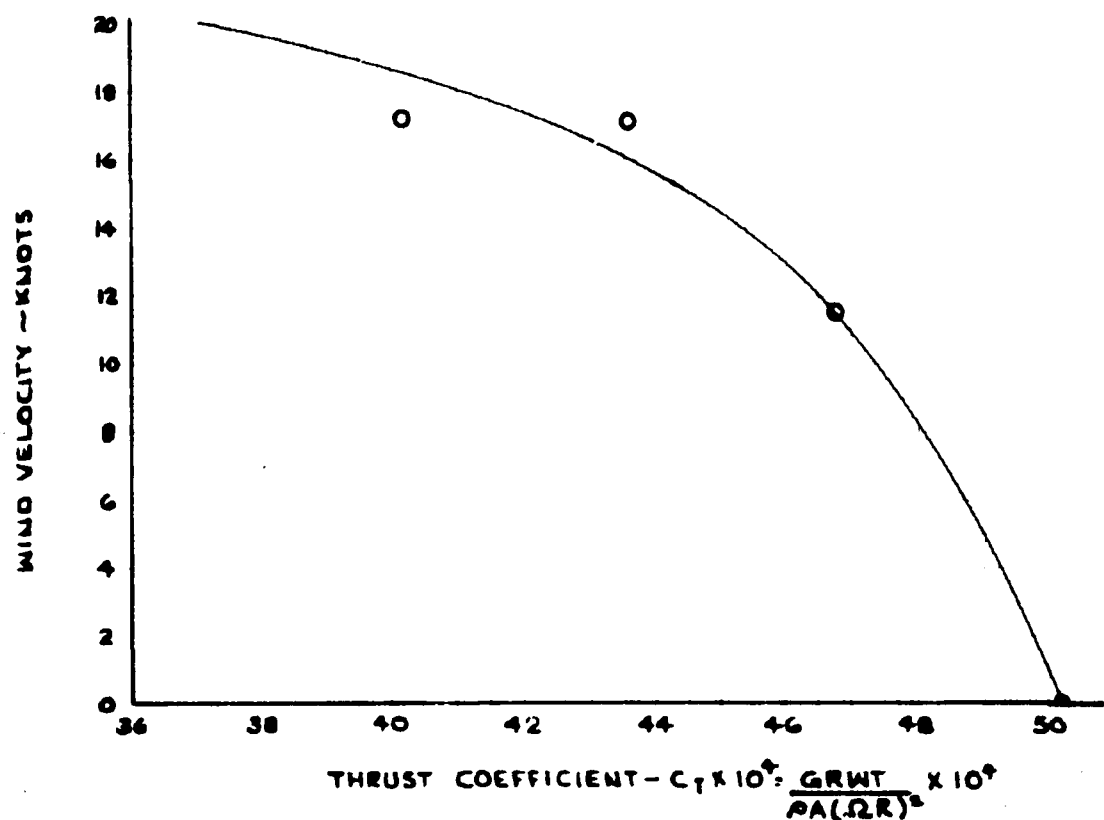


FIGURE NO. 97
DIRECTIONAL CONTROL SUMMARY
 AH-1G USA S/N 615247

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
 ALTITUDE GROSS WEIGHT LONG. C.G. ROTOR SPEED THRUST COEFF.
 H₀ ~ FT ~ LB ~ IN. ~ RPM ~ CT
 140 8060 200.4 (AFT) 324 0.004018

- NOTES:
 1. 107° DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
 2. YAW SCAS OFF
 3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.0° IN FROM FULL LEFT
 4. SHADED AREAS REPRESENT LESS THAN 10% DIRECTIONAL CONTROL MARGIN
 5. POINTS DERIVED FROM FIGURES 101 THROUGH 107, APP VII

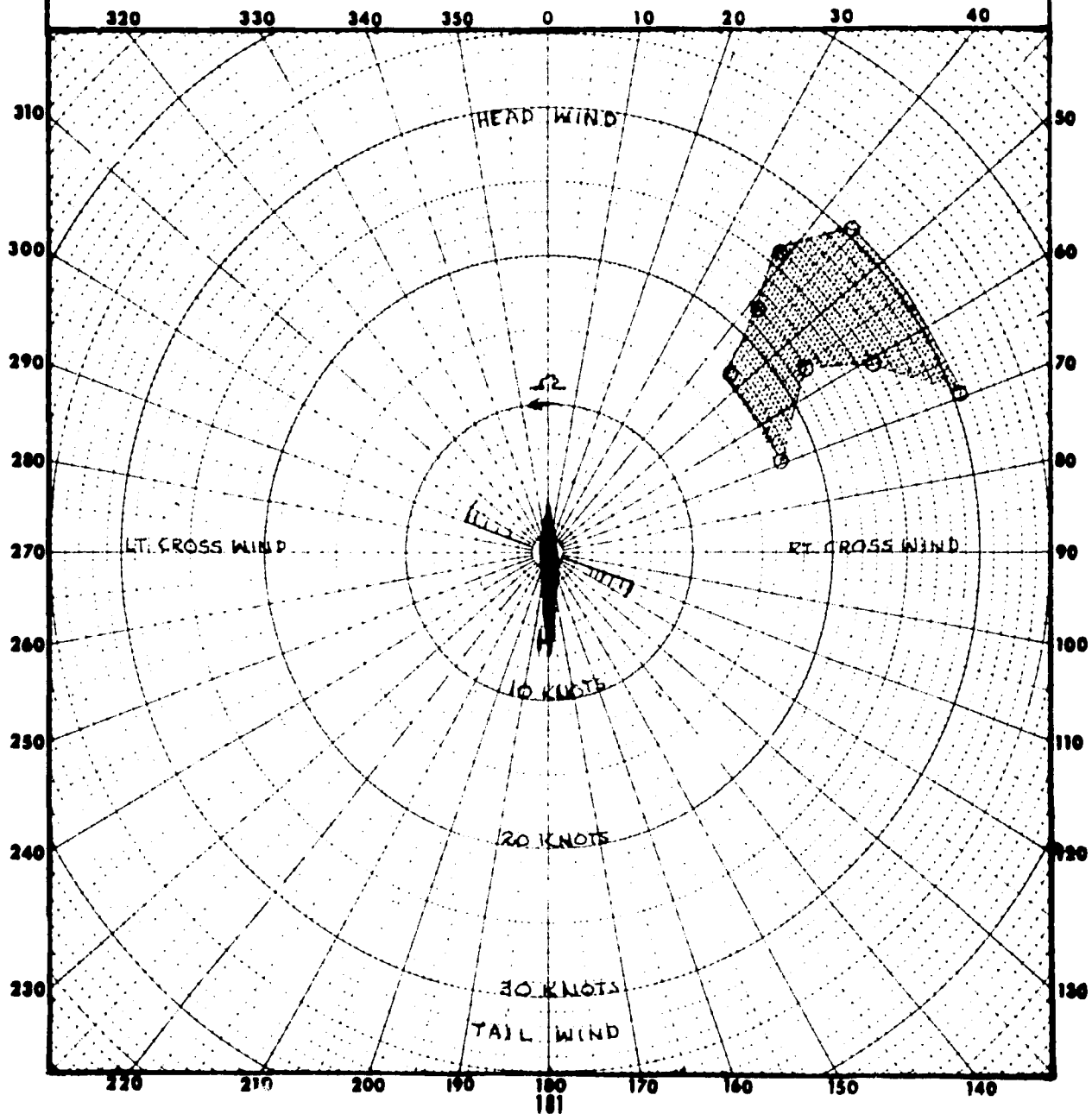


FIGURE NO. 98
DIRECTIONAL CONTROL SUMMARY
AH-1G USA SN 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
 ALTITUDE GROSS WEIGHT LONG. CG. ROTOR SPEED THRUST COEFF.
 H₀ ~ FT. ~ LB. ~ IN. ~ RPM ~ CT
 -40 8245 149.6 (AFT) 314 0.004353

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN. FROM FULL LEFT
4. SHADED AREA REPRESENTS LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM FIGURES 108 THROUGH 114, APP. VII

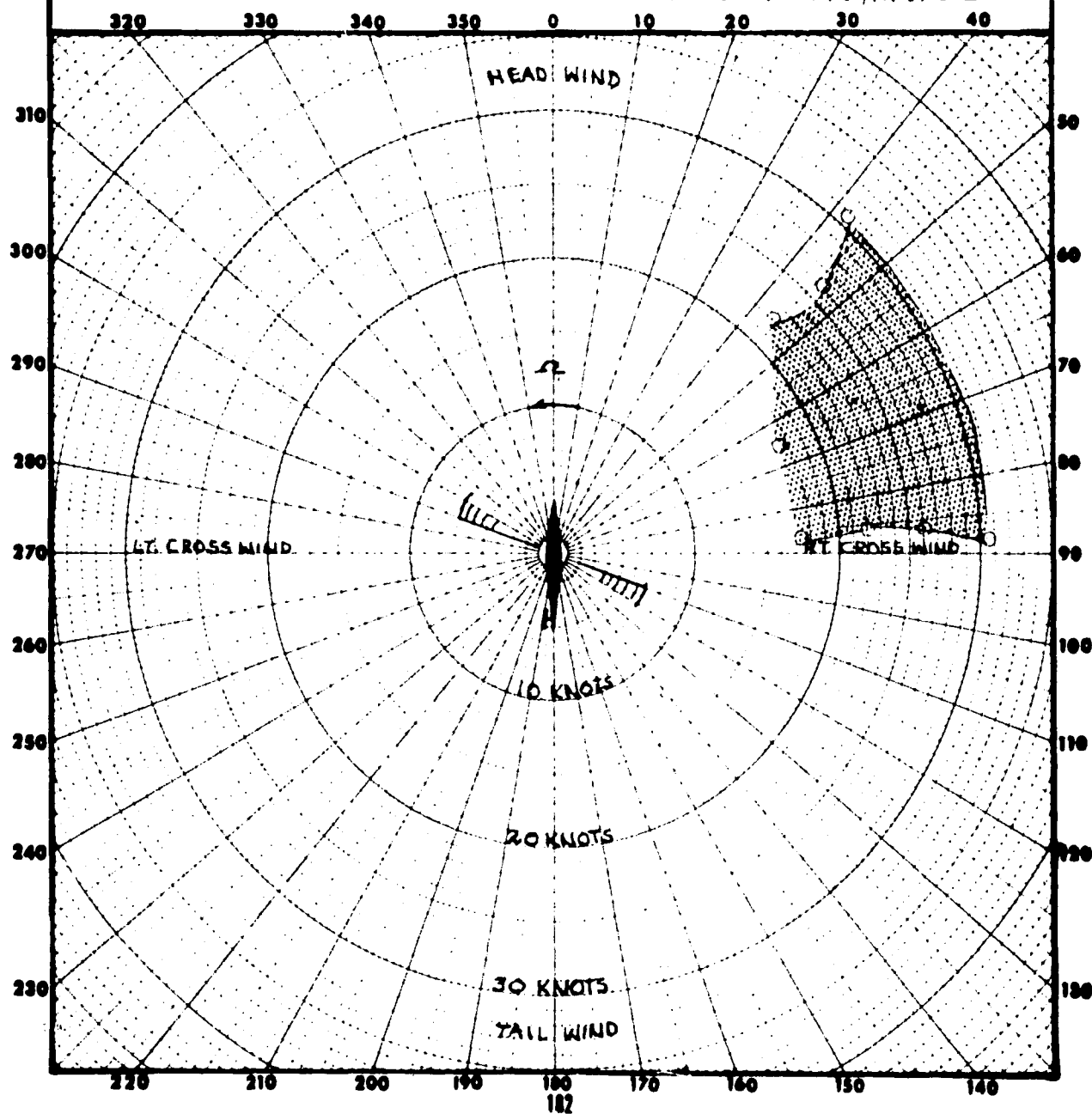


FIGURE No. 99 **DIRECTIONAL CONTROL SUMMARY**

AH-1G USA 4NG15247

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

ALTITUDE	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	THRUST COEFF
H ₀ ~ FT	~ LB.	~ IN.	~ RPM	~ C _T
5270	8050	200.7 (AFT)	324	0.004678

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN. FROM FULL LEFT
4. SHADED AREA REPRESENTS LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM **FIGURES 118 THROUGH 121 APP VII**

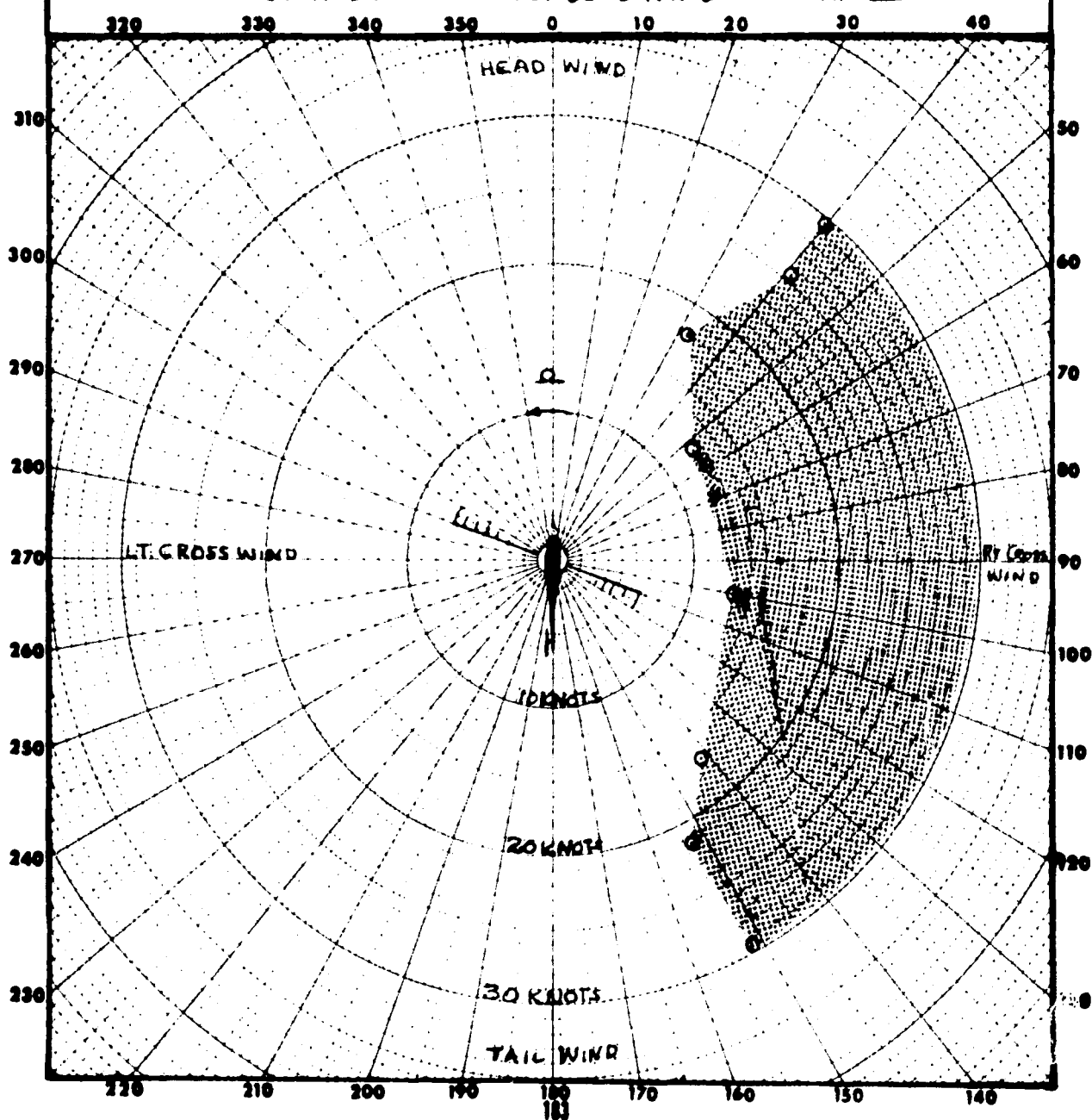


FIGURE No 100 DIRECTIONAL CONTROL SUMMARY

AH-1G USAF 615247

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

ALTITUDE H ₀ ~ FT.	GROSS WEIGHT ~ LB	LONG. CG. ~ IN.	ROTOR SPEED ~ RPM	THRUST COEFF. ~ C _T
11120	7210	195.4 (MID)	324	0.005023

NOTES:

1. 10% DIRECTIONAL CONTROL REMAINING FROM MEAN CONTROL POSITION REQUIRED DURING STABILIZED FLIGHT CONDITION
2. YAW SCAS OFF
3. TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 IN. FROM FULL LEFT
4. SHADED AREA REPRESENTS LESS THAN 10% DIRECTIONAL CONTROL MARGIN
5. POINTS DERIVED FROM FIGURES 122 THROUGH 124 APP VII

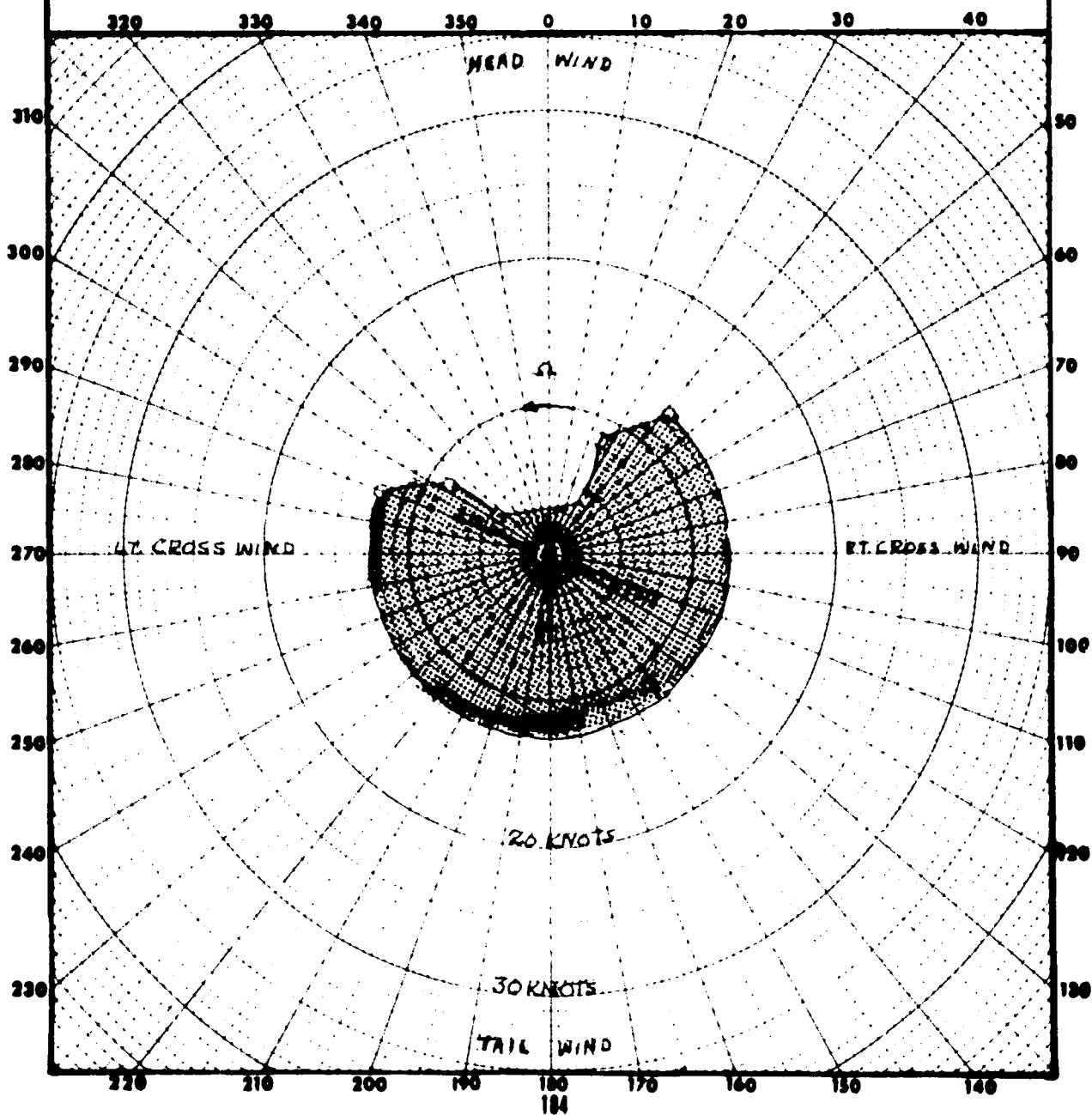


FIGURE No. 101
 STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND ARRHUTH
 AH-1G USA 6615247
 HVT. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTAS 4.5 DENSITY ALTITUDE H_D ~ FT. 120 GROSS WEIGHT ~ LB 8110 LONG C.G. ~ IN 200.1 (AFT) ROTOR SPEED N_R ~ RPM 334.0 Rotor Pitch 7 TO 15 Thrust Coeff. 0.004840

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH A CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

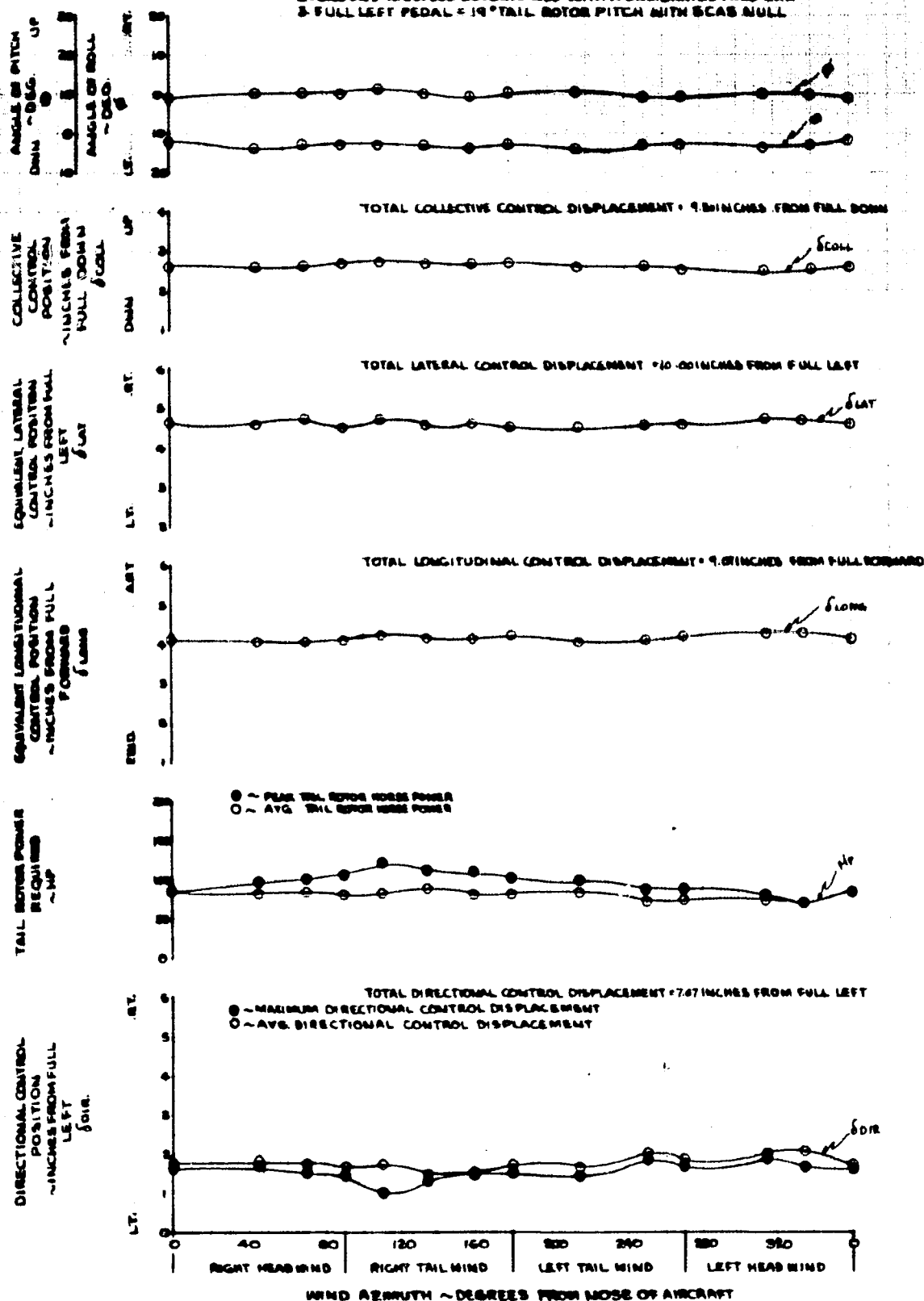


FIGURE NO. 102
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USAF 655867
 HVT SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTAS 9.0 DENSITY ALTITUDE ~ FT. 120 GROSS WEIGHT ~ LB. 8000 LONG. C.G. ~ IN. 200.7 (AFT) ROTOR SPEED ~ RPM 324.0 SKID HEIGHT ~ FT. 7.015 THRUST COEFF. ~ CT 0.003986

NOTES: 1 TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2 GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3 FULL LEFT PEDAL - 19° TAIL ROTOR PITCH WITH SCAS NULL

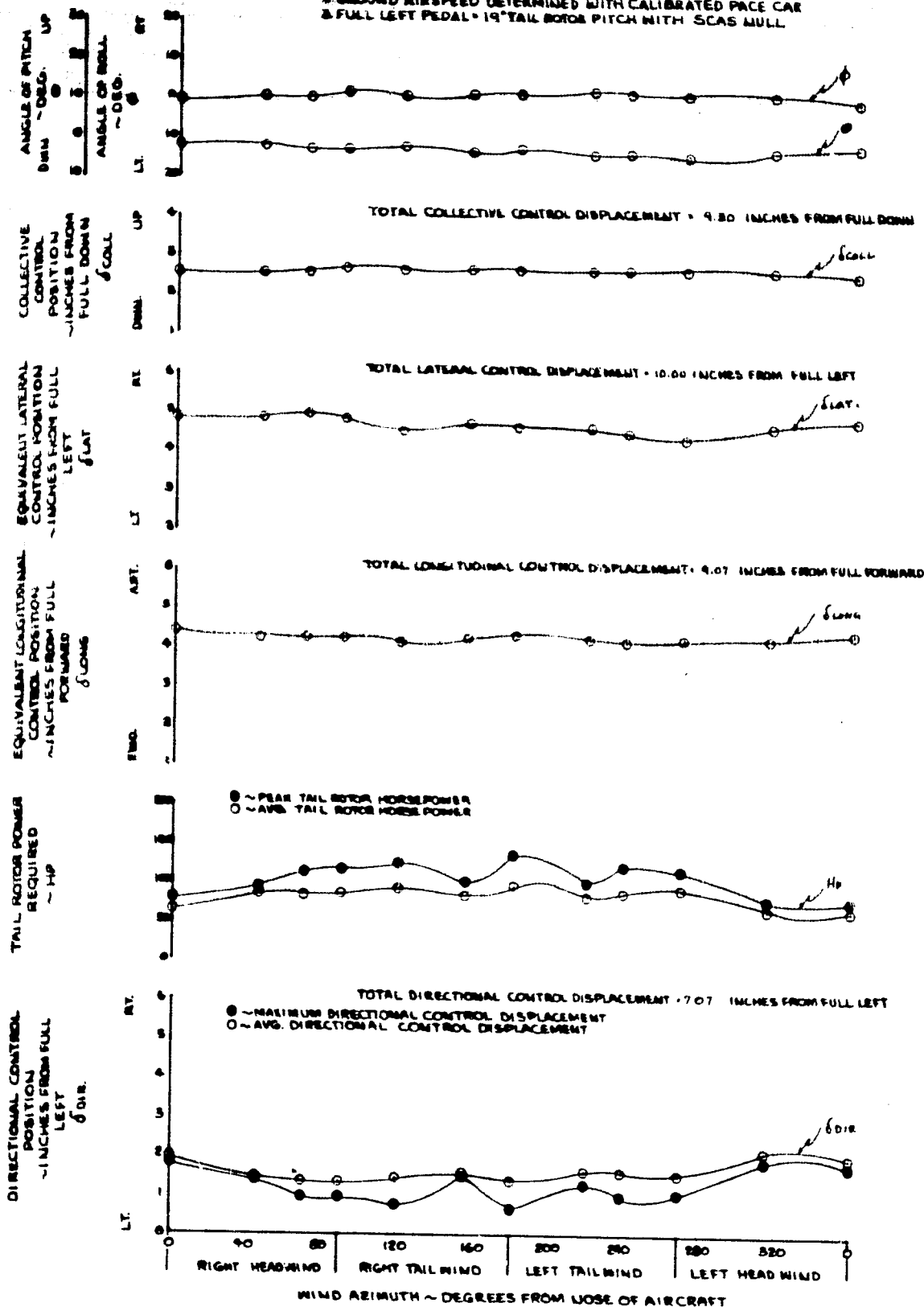


FIGURE No 103
 STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USAF 15247
 HVT SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTAS 13.0 DENSITY ALTITUDE ~ FT 120 GROSS WEIGHT ~ LB 8080 LONG C.G. ~ IN. 200.5(AFT) ROTOR SPEED ~ RPM 324.0 SKID HEIGHT ~ FT 7 TO 15 THROUST CORR. ~ CY 0.004026

NOTES: 1 TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2 GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3 FULL LEFT PEDAL • 19° TAIL ROTOR PITCH WITH SCAS NULL

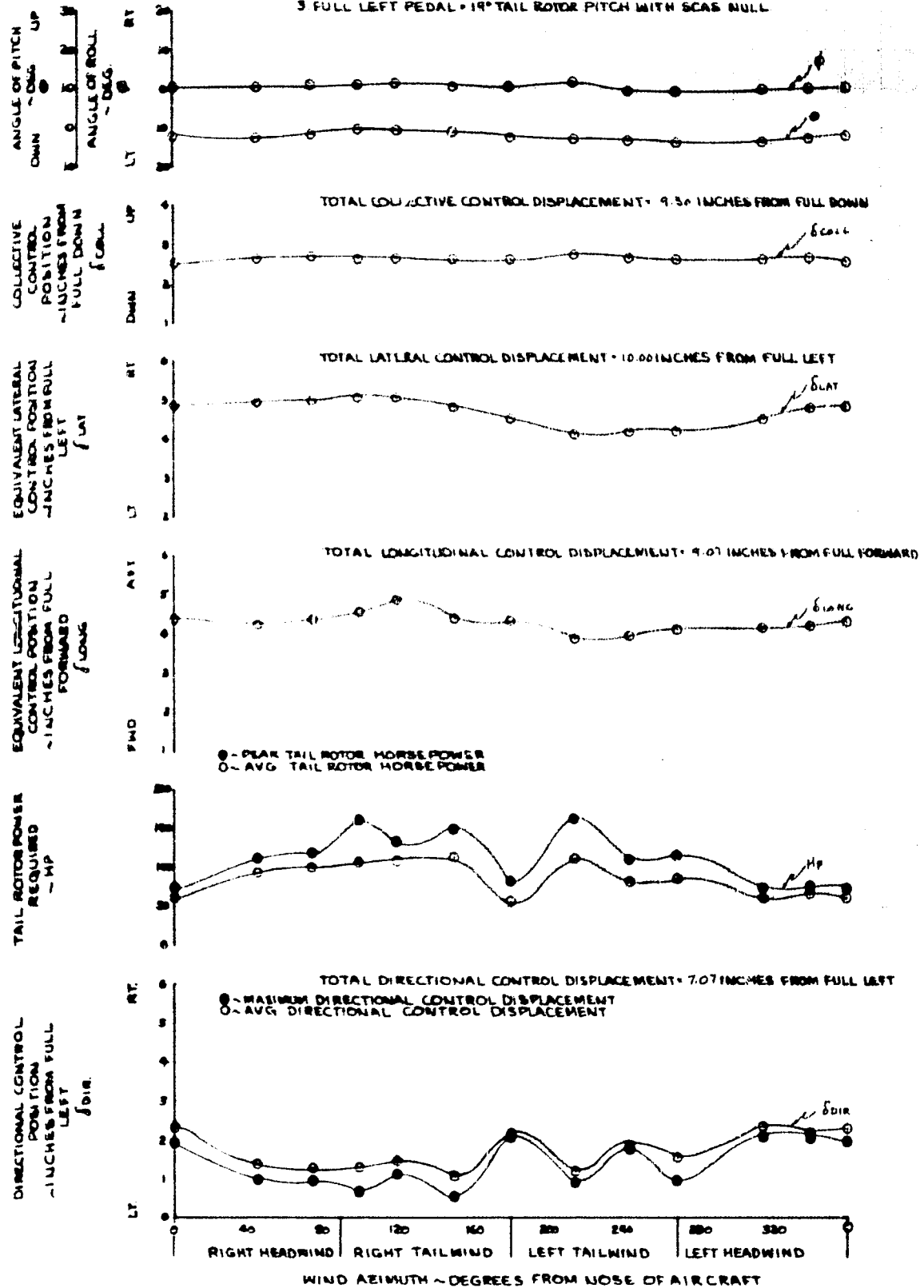


FIGURE NO. 104
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
AM-1C USA 2613847
NAVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED ~KTS	DENSITY ~ST	ALTITUDE ~FT	GROSS WEIGHT ~LB	LONG. C.G. ~IN	ROTOR SPEED ~RPM	WING HEIGHT ~FT	THrust Coeff ~C _T
17.5	12.0	0000	2000 (APT)	324.0	77018	0.004016	

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED PLUS WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 19° TAIL ROTOR PITCH WITH SCAB NULL

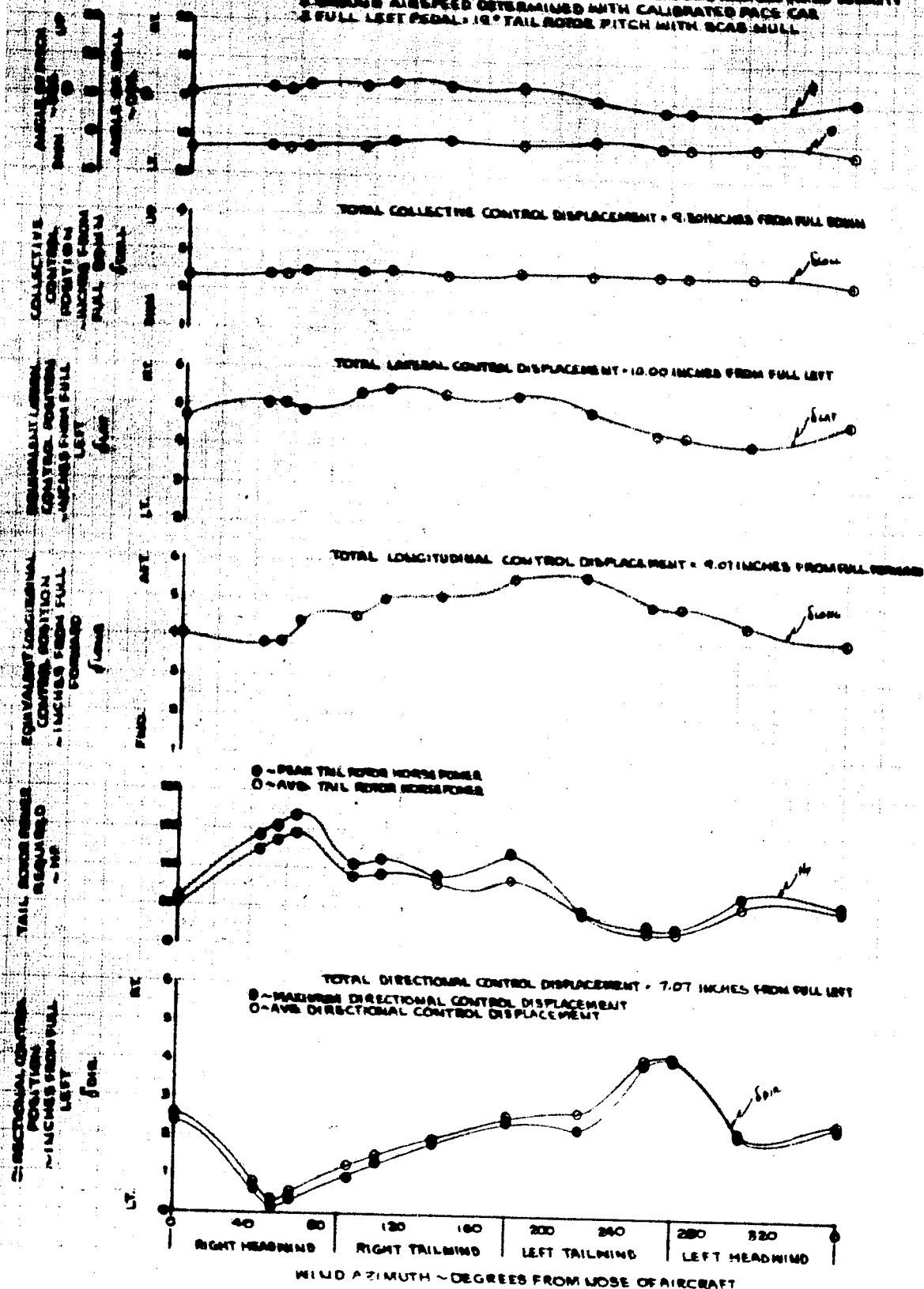


FIGURE NO. 105
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
AH-1G USAF 5247
KVV. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTAS 22.0 DENSITY ALTITUDE ~ FT. 120 GROSS WEIGHT ~ LB. 9060 LONG. C.G. ~ IN. 200.5 (N7) ROTOR SPEED ~ RPM 324.0 Rotor Height ~ FT. 7.1015 Thrust Coeff. ~ CT 0.004016

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 19° TAIL ROTOR PITCH WITH SCAS NULL

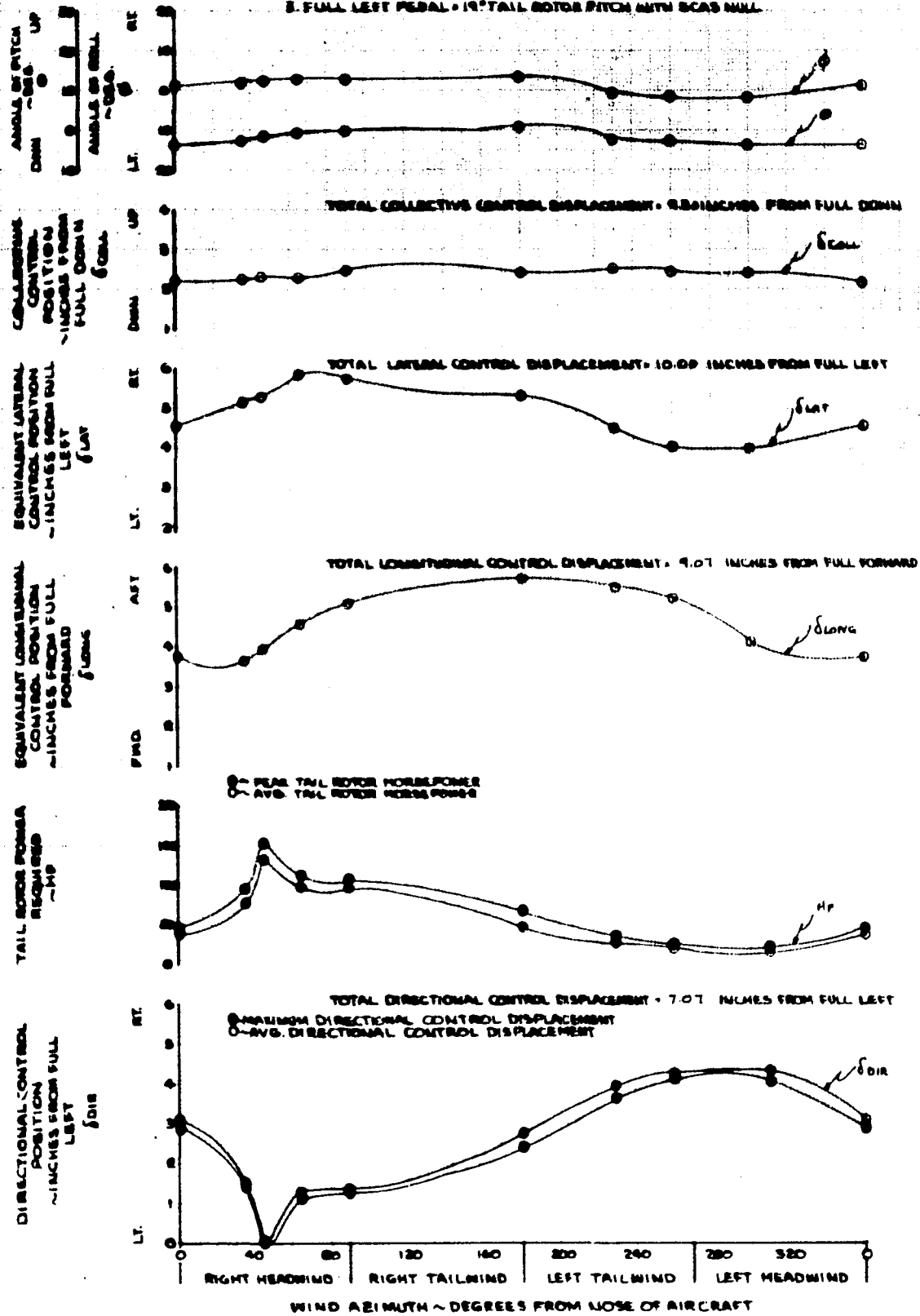


FIGURE NO. 106
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AN-10 USA NC15247
 HVT SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED	DENSITY	ALTITUDE	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	WING HEIGHT	THRUST COEFF
~ KTAS	~ LB	~ FT	~ LB	~ IN	~ RPM	~ FT	~ CT
26.0	100	8020	2000 (W/F)	22.40	770 IS	0.006004	

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 14" TAIL ROTOR PITCH WITH SCAS NULL

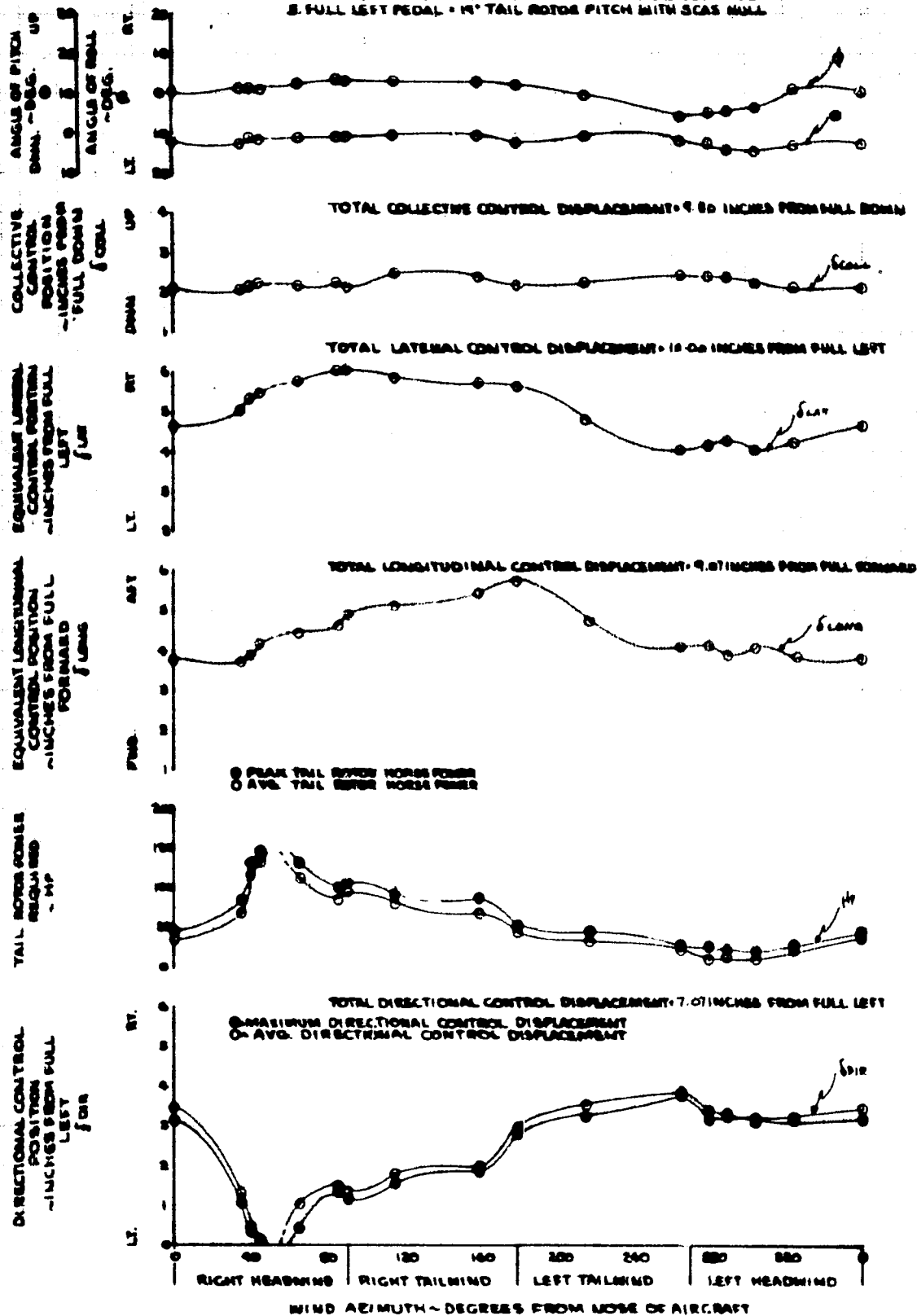


FIGURE NO. 107
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 561264
 HUY SCOUT CONFIGURATION WITH ROCKET PDB FAIRINGS REMOVED

AIR SPEED DENSITY ALTITUDE GROSS WEIGHT LONG. C.G. ROTOR SPEED SKID HEIGHT THRUST COEFF.
 ~ KIAS ~ FT ~ LB ~ IN. ~ RPM ~ FT ~ CT
 30.5 230 8080 208.1 (AST) 326.9 7.7015 0.004039

NOTE: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = R* TAIL ROTOR PITCH WITH SCAS NULL

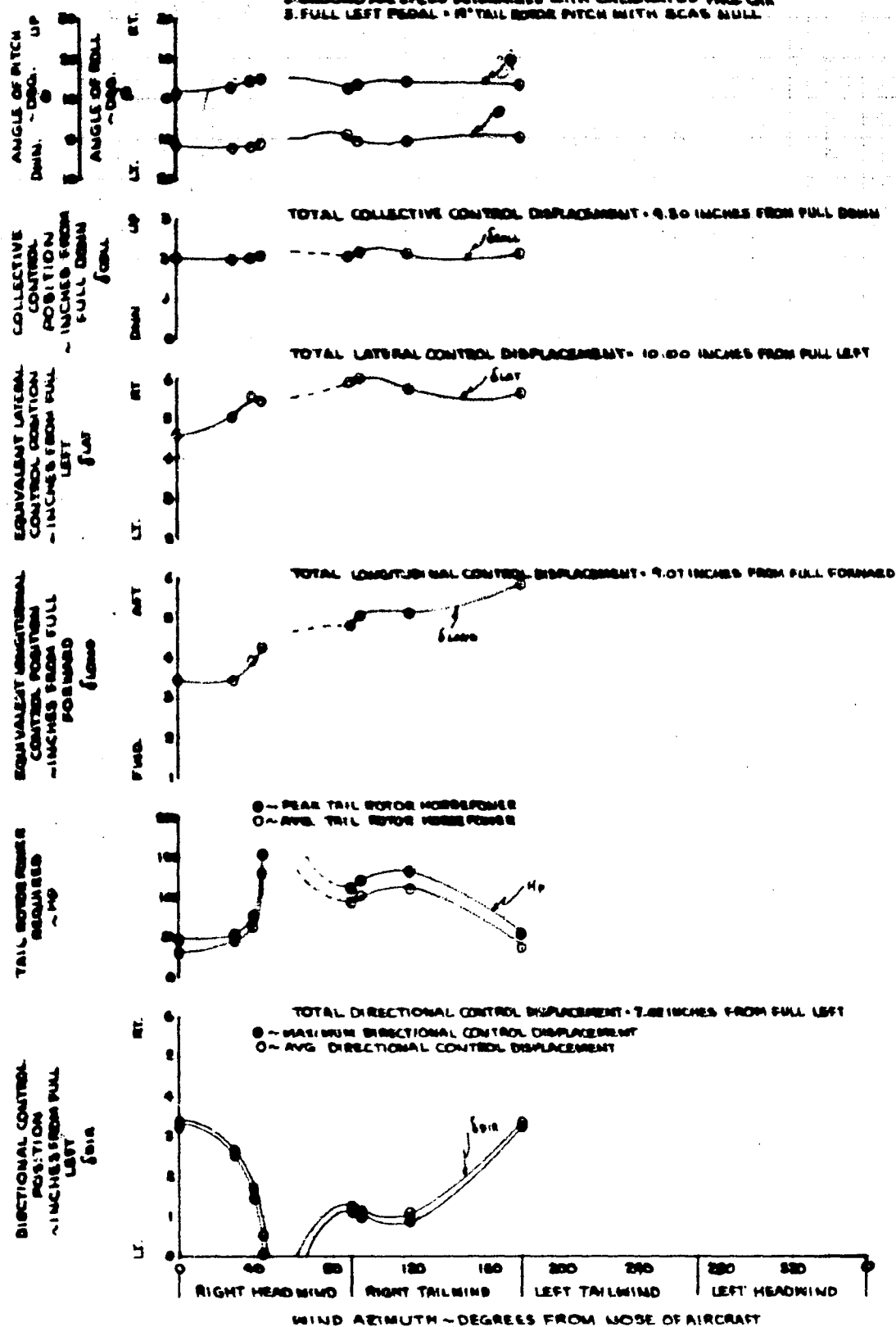


FIGURE NO. 108
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
AH-1G USAF 612267
NAVY SCOUT CONFIGURATION WITH ROCKET PODS/SAILINGS REMOVED

AIR SPEED ~ KTS 4.5 DENSITY ~ LB/FT³ 0.000570 ALTITUDE ~ FT 5000 CROSS HEIGHT ~ FT 200-2500 LONG. C.G. ~ IN. 214.0 ROTOR SPEED ~ RPM 214.0 AIR HEIGHT ~ FT 7 TO 18 THRUST COEFF. ~ C_T 0.004342

NOTES: 1. TRIM AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 10° TAIL ROTOR PITCH WITH SCAS MULL

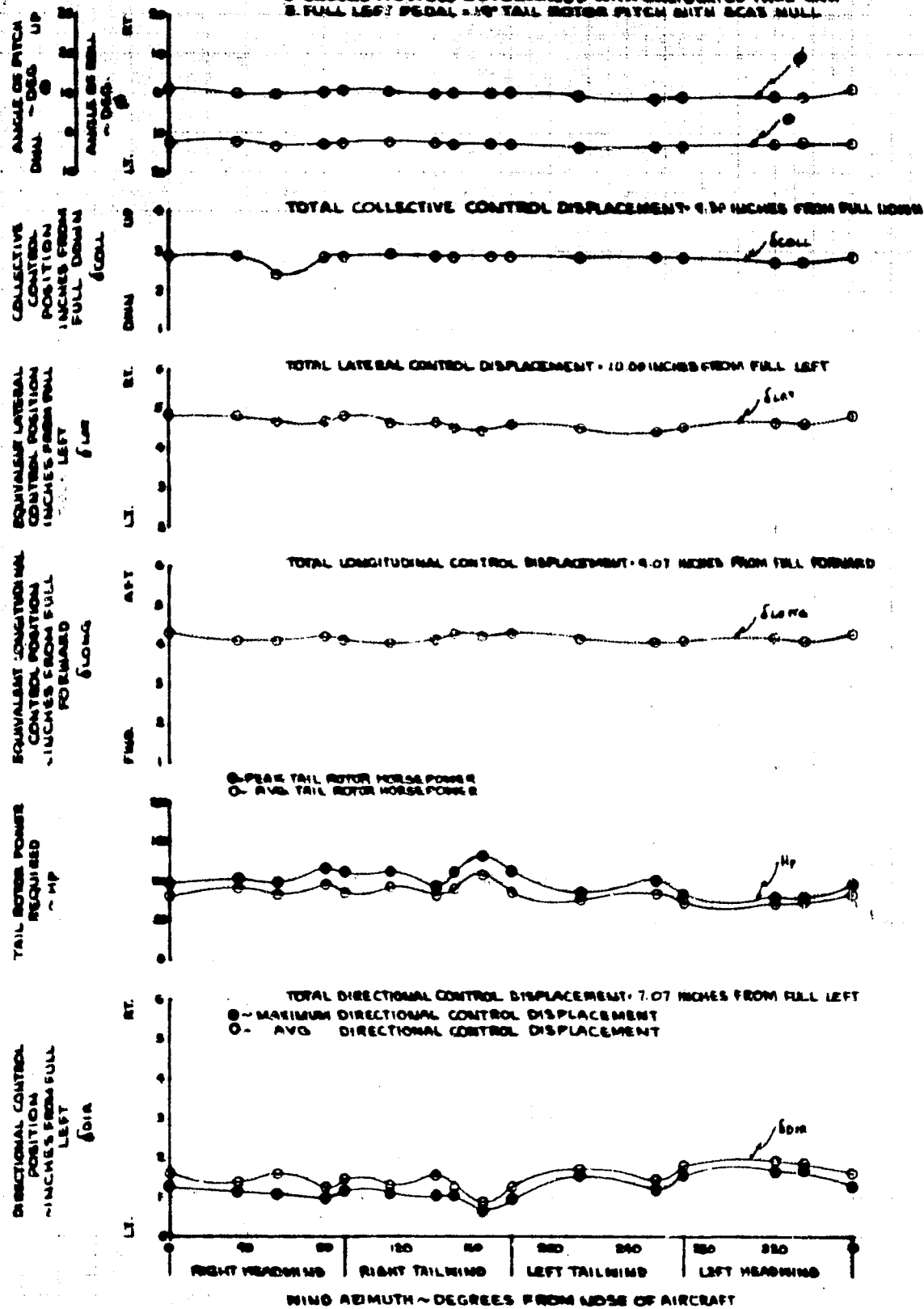


FIGURE NO. 109
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 4615247
 MVV. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTS 90 DENSITY ~ LB/FT³ 0.70 ALTITUDE ~ FT 8060 GROSS WEIGHT ~ LB 8060 LONG. C.G. ~ IN. 200.8 (aft) ROTOR SPEED ~ RPM 3400 SIDE HEIGHT ~ FT 7 TO 15 THRUST COEFF ~ CT 0.004832

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 19° TAIL ROTOR PITCH WITH SCAS NULL

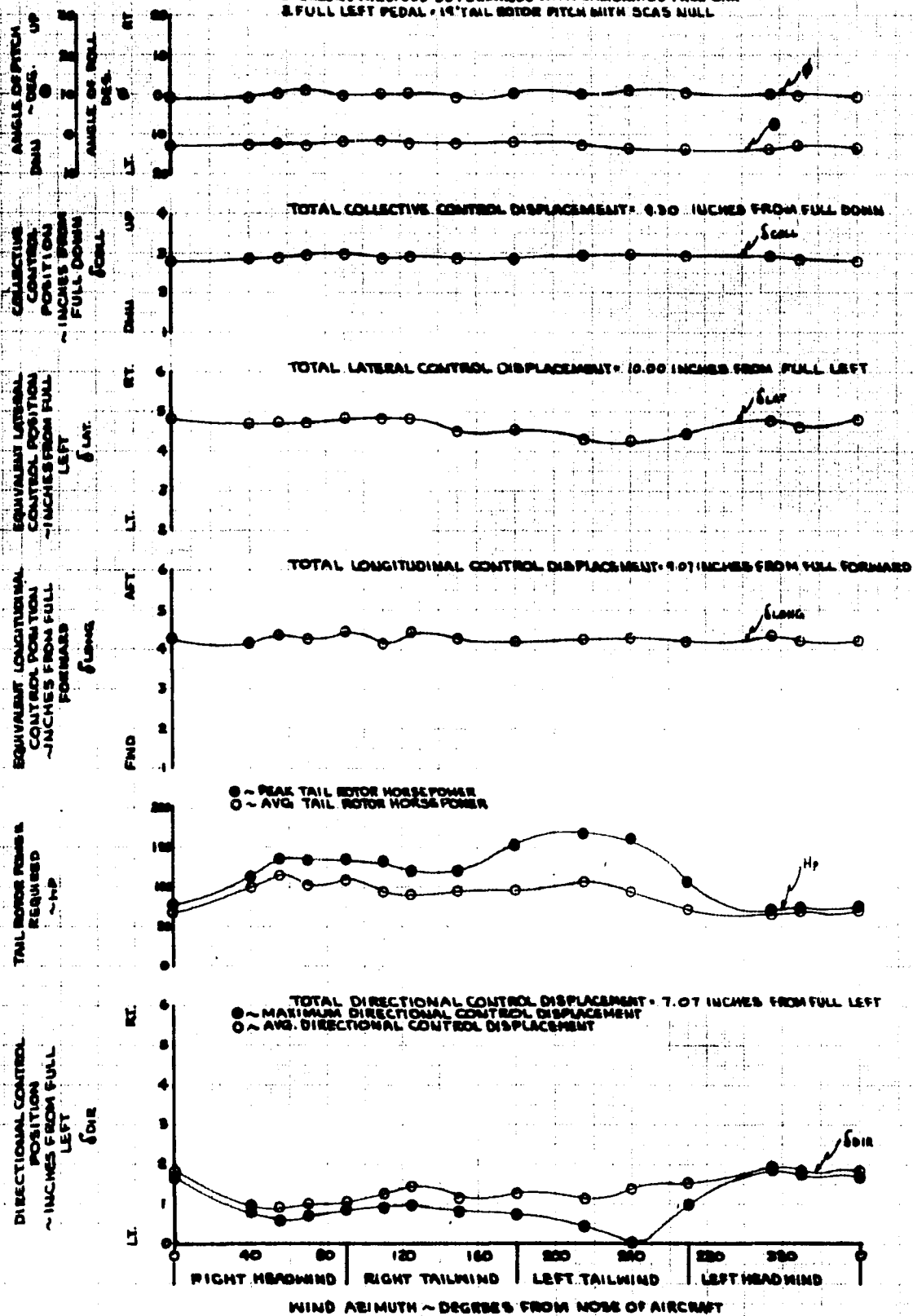


FIGURE NO. 110
STATIC TRIM STABILITY IN GROUND EFFECT WITH VARIOUS WIND DIRECTION
 AH-1G USA 6, C15 247
 HWY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

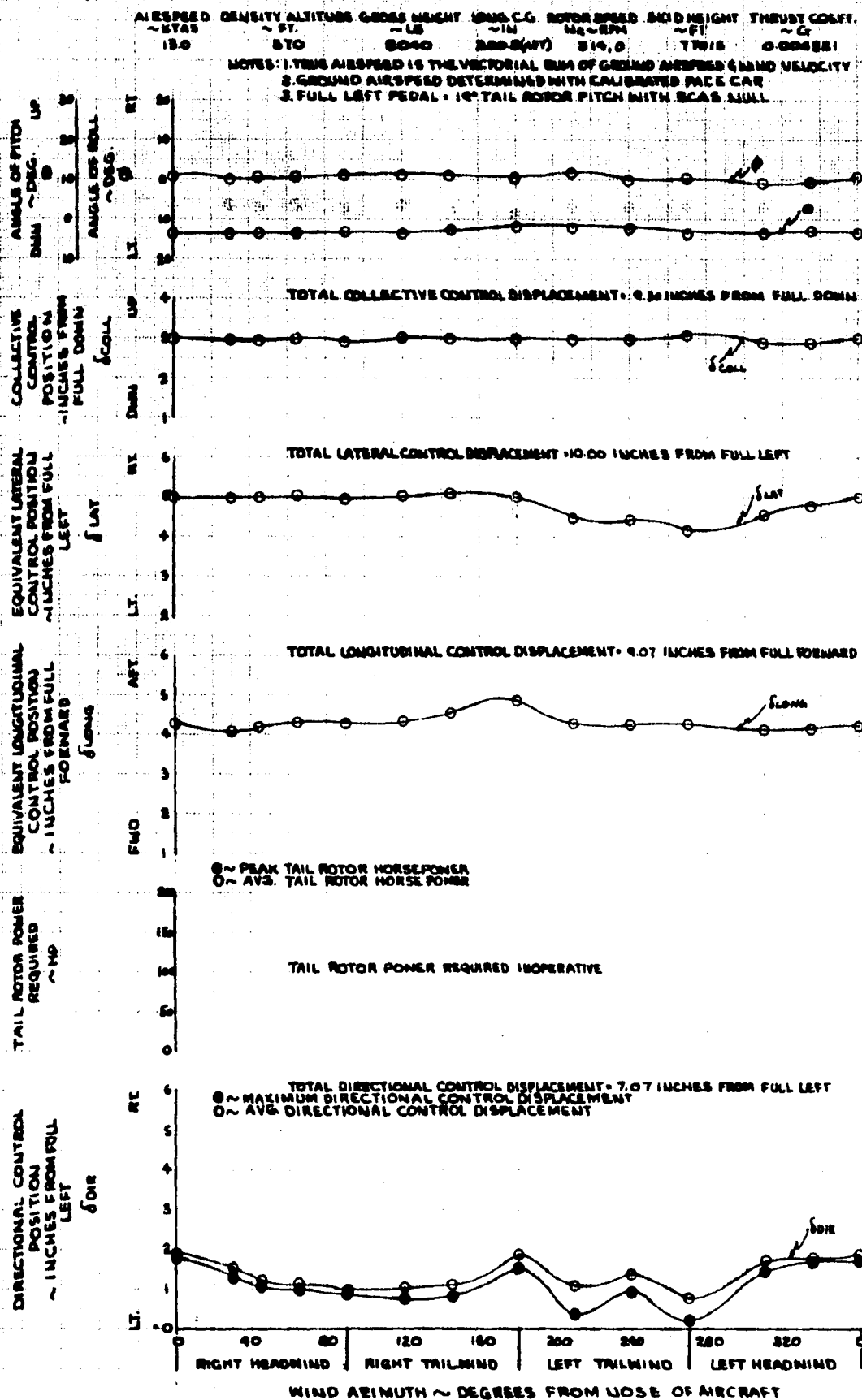


FIGURE No. III
STATIC TRIM STABILITY IN GROUND EFFECT WITH VARIOUS WIND AZIMUTH
 AH-1G USA 4615267
 HVT SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~KTAS 17.5 DENSITY ~FT 400 ALTITUDE ~LB 2860 LONG. C.G. ~IN. 199.0(M) ROTOR SPEED NR~RPM 314.0 SKID HEIGHT ~FT 7 TO 15 THRUST COEFF ~CT 0.004568

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

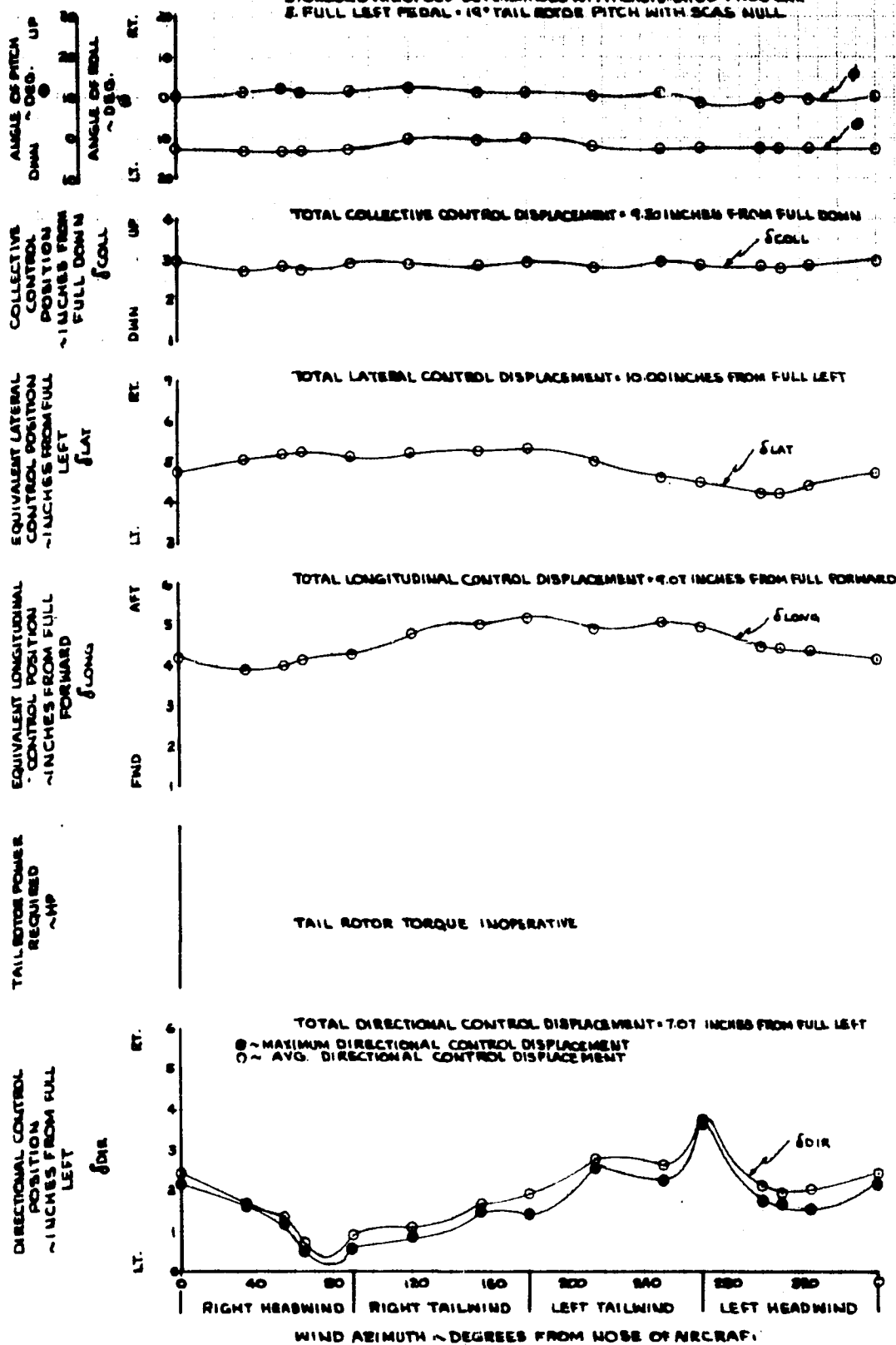


FIGURE No. 12
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND DIRECTION
 AH-1G USAF 615 207
 HVT SCOUT CONFIGURATION WITH ROCKET FOR FAIRINGS REMOVED

AIR SPEED ~ KTAS 22.0 DENSITY ~ ST -0.000 ALTITUDE ~ FT 6000 GROSS WEIGHT ~ LB 14000 (207) LONG. C.G. ~ IN 140.0 (207) ROTOR SPEED ~ RPM 514.0 SKID ~ FT 7 TO 15 THROUST COEFF. ~ CT 0.004410

NOTES: 1. TEST AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 10" TAIL ROTOR PITCH WITH SCAS NULL

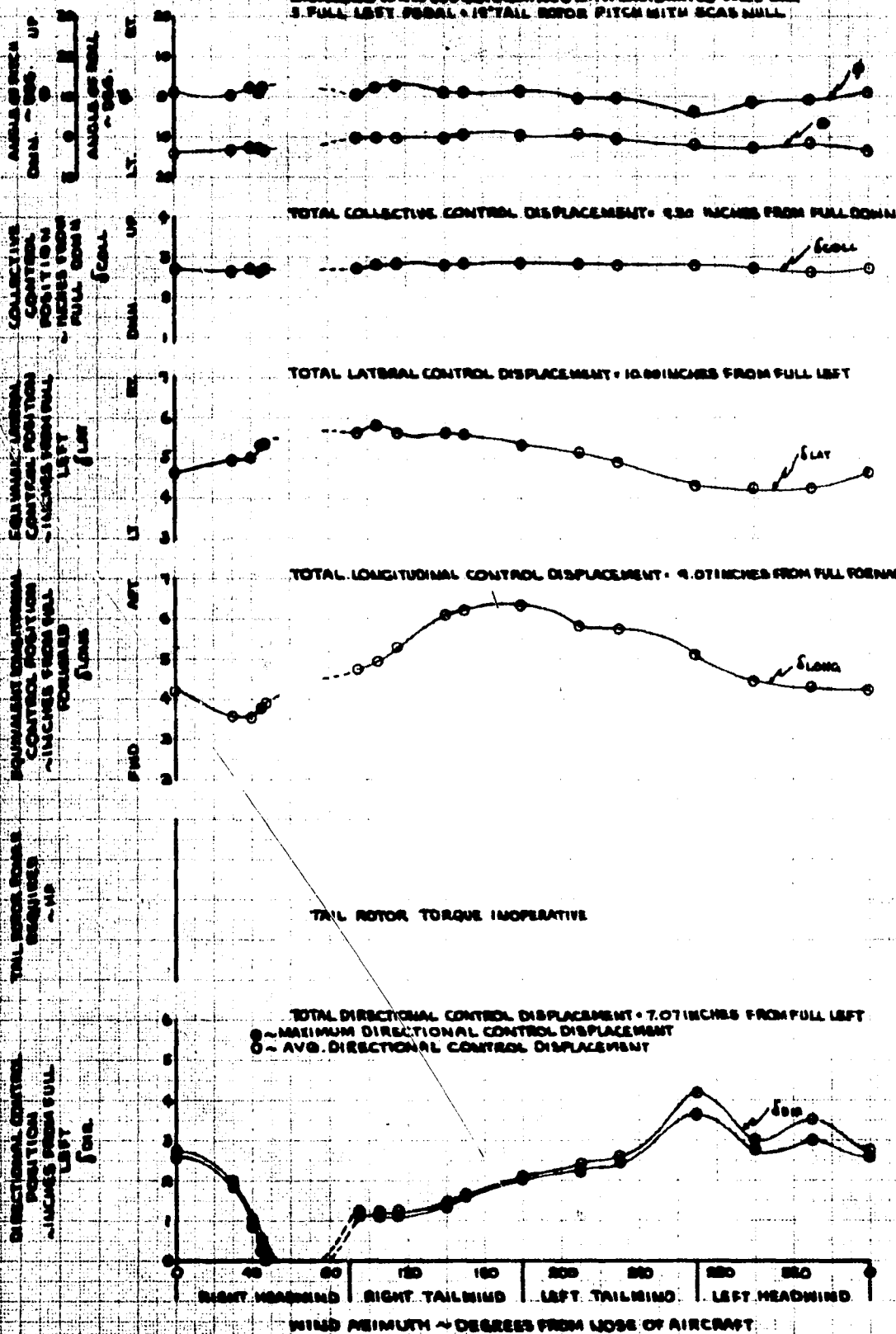


FIGURE No. 113
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 4615247
 H.V. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED DENSITY ALTITUDE GROSS WEIGHT ENGINE SPEED ENGINE HEIGHT THROUST COEFF.
 ~KTAS ~FT. ~LB ~MIN ~MAX ~RPM ~FT. ~C_T
 26.0 -400 8340 198.7(AFT) 314.6 7 TO 15 0.004358

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL + 19° TAIL ROTOR PITCH WITH SCAS NULL

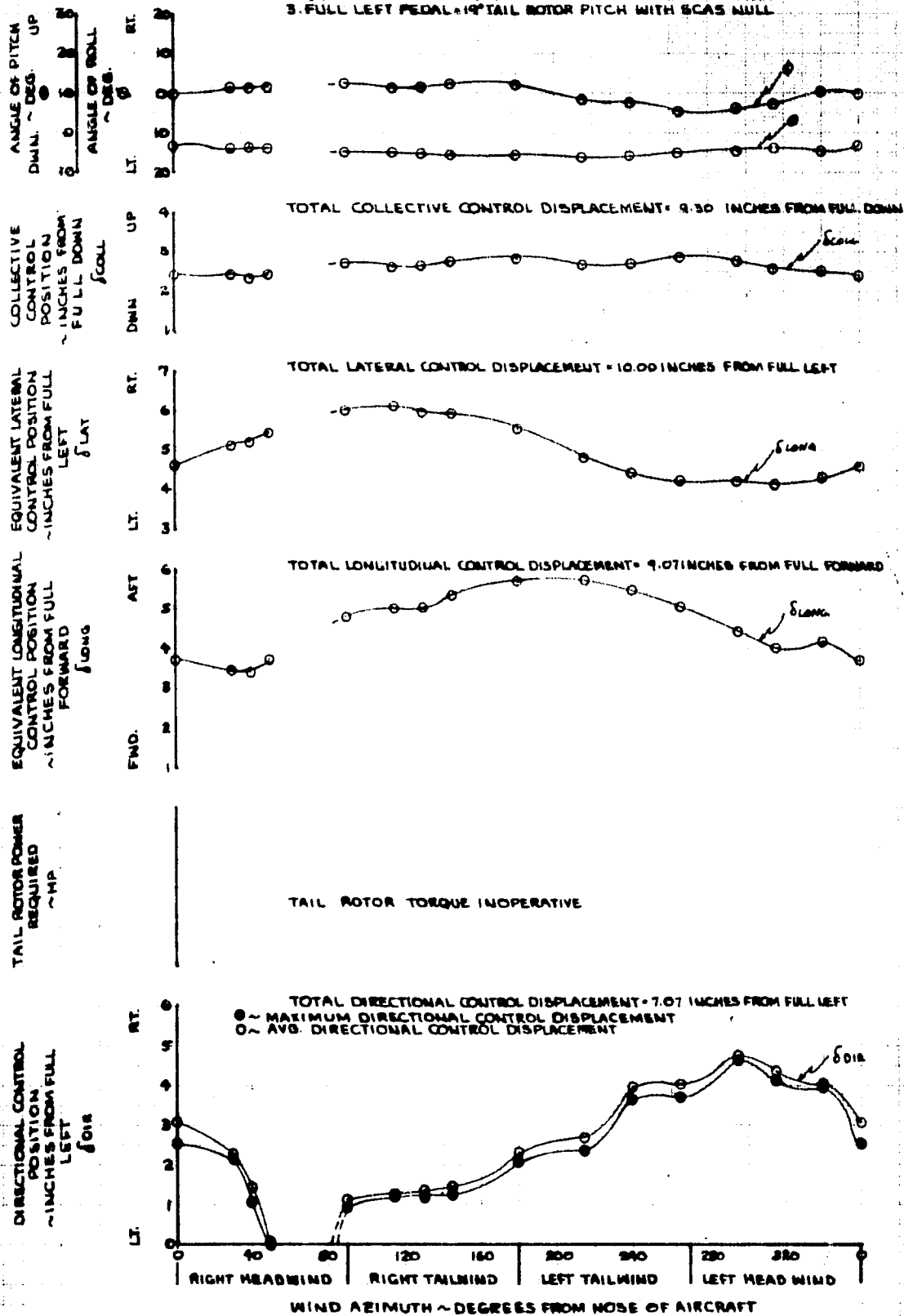
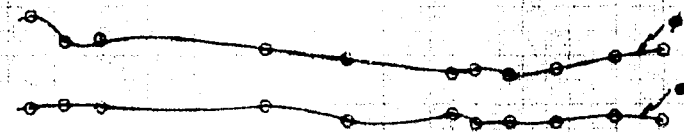
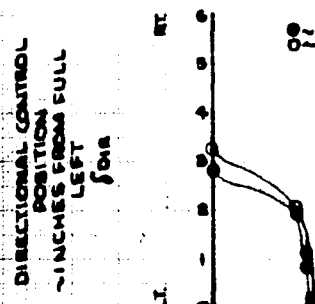
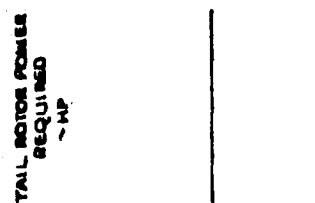
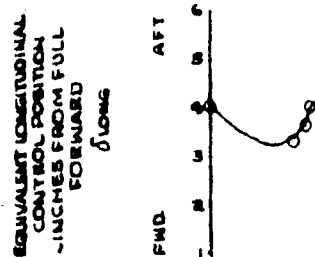
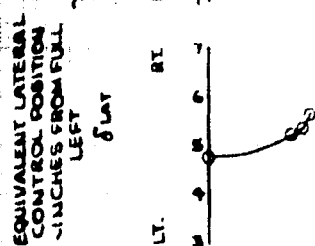
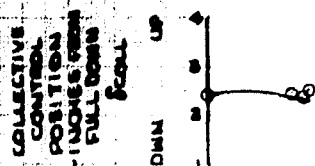
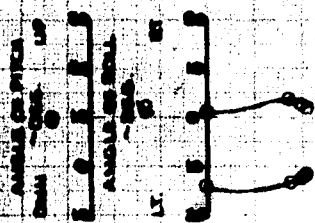


FIGURE No 114
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 9615 247
 HWY. SCOUT CONFIGURATION WITH ROCKET PODFAIRINGS REMOVED

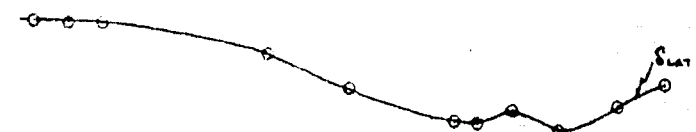
AIR SPEED ~KTAS 20.5 DENSITY ALTITUDE ~FT -400 GROSS WEIGHT ~LB. 8290 LONG. C.G. ~IN 198.7 (APT) ROTOR SPEED ~RPM 314.0 SKID HEIGHT ~FT 7 TO 15 THRUST COEFF. ~CT 0.004531

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

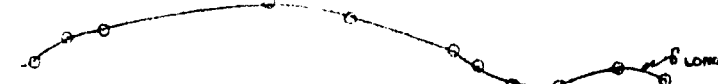


TOTAL COLLECTIVE CONTROL DISPLACEMENT = 9.30 INCHES FROM FULL DOWN

TOTAL LATERAL CONTROL DISPLACEMENT = 10.00 INCHES FROM FULL LEFT

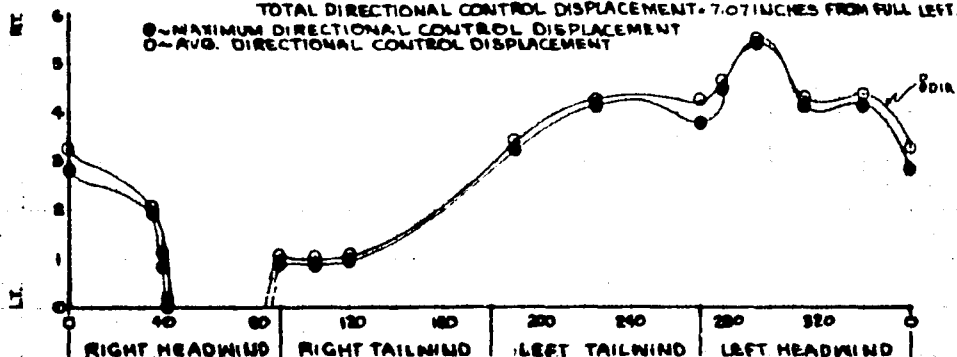


TOTAL LONGITUDINAL CONTROL DISPLACEMENT = 9.07 INCHES FROM FULL FORWARD



TAIL ROTOR TORQUE INOPERATIVE

TOTAL DIRECTIONAL CONTROL DISPLACEMENT = 7.07 INCHES FROM FULL LEFT
 ● ~ MAXIMUM DIRECTIONAL CONTROL DISPLACEMENT
 ○ ~ AVG. DIRECTIONAL CONTROL DISPLACEMENT



WIND AZIMUTH ~ DEGREES FROM NOSE OF AIRCRAFT

FIGURE No. 115
STATIC TRIM STABILITY IN GROUND EFFECT AT LOW WIND AZIMUTH
 AH-1G USA REG 15267
 H.V.Y. SCOUT CONFIGURATION WITH ROCKET FOD FAIRINGS REMOVED

AIR SPEED: 45 KIAS DENSITY ALTITUDE: 5130 FT GROSS WEIGHT: 8000 LB LONG. C.G. FROM ROTOR: 200.4 (IN) MAX. RPM: 2840 7 TO 15 0-800000

NOTES: 1. TRUE AIR SPEED IS THE VECTORIAL SUM OF GROUND AIR SPEED AND WIND VELOCITY
 2. GROUND AIR SPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS HULL

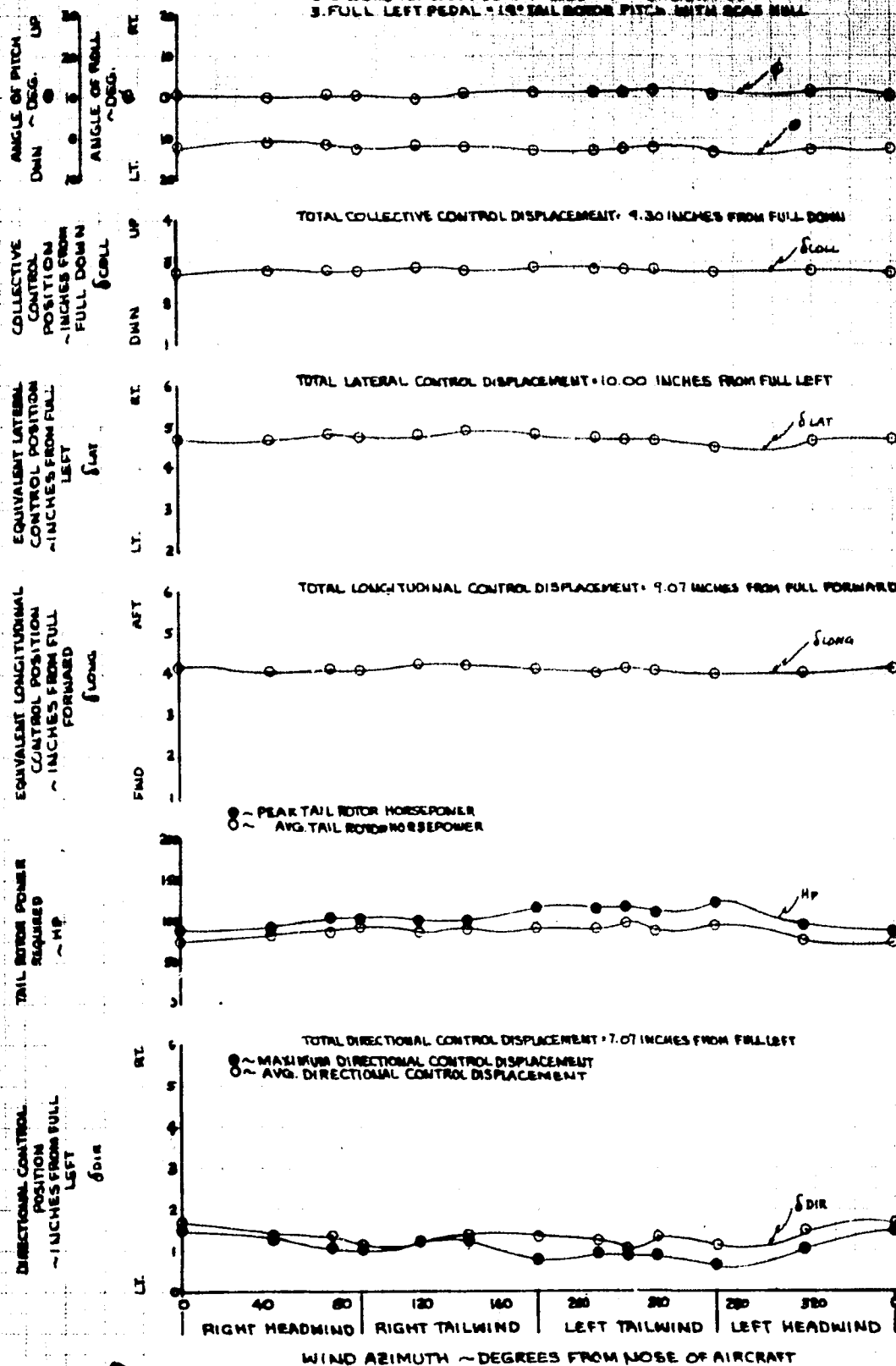


FIGURE No. 116
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND ABIMUTH
 AN-18 USA 14615247
 NAVY SCOUT CONFIGURATION WITH ROCKET POG FAIRING REMOVED

AIR SPEED ~ KTAS 85 DENSITY ~ FT 5260 ALTITUDE ~ LB 8070 GROSS WEIGHT ~ IN. 220.0775 LONG. C.G. ~ IN. 234.0 ROCKET POG SKID HEIGHT ~ FT 7.1016 THRUST COEFF. ~ G 0.004687

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

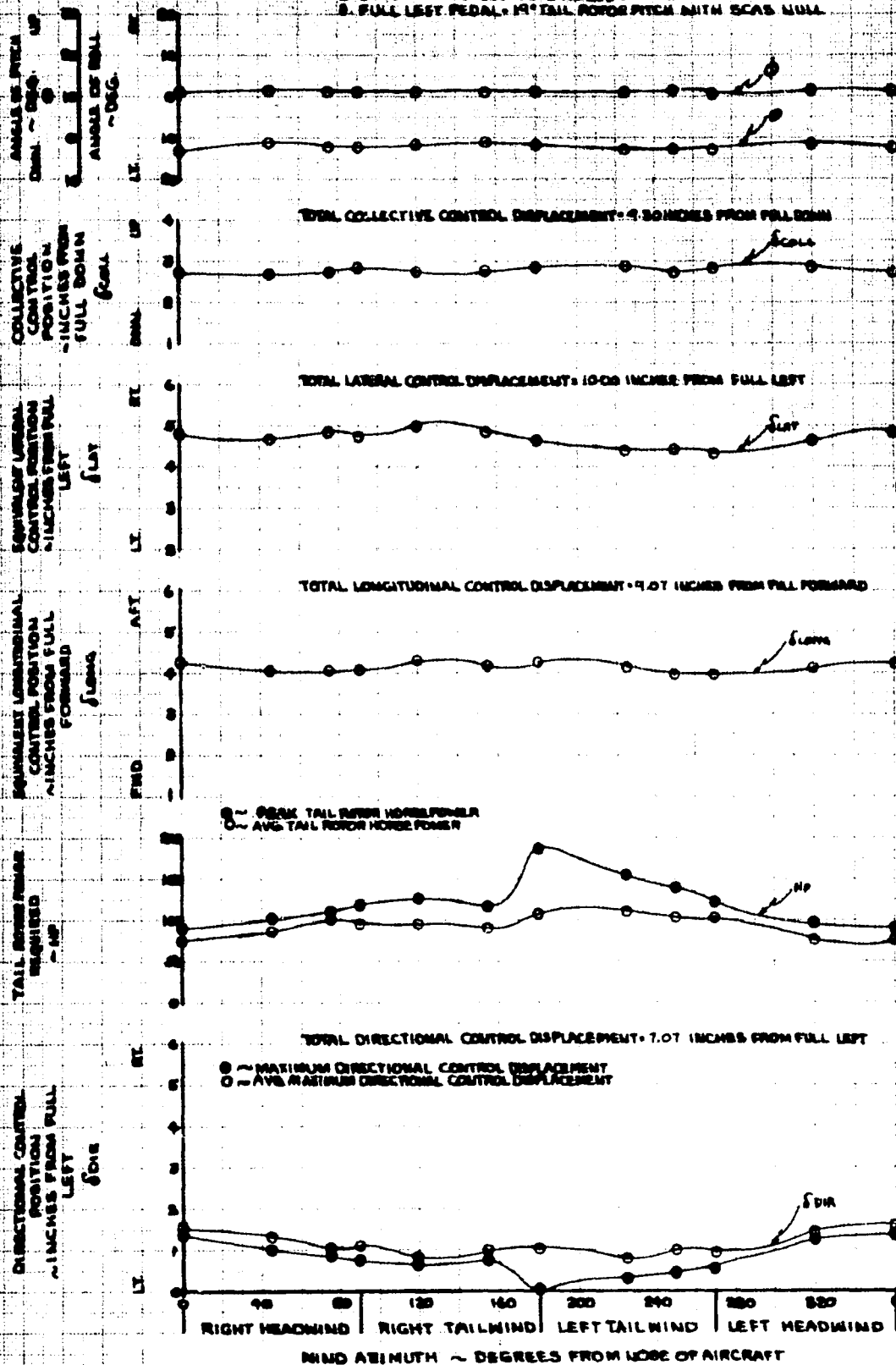


FIGURE No. 117
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND ARITH
 AH-1G USA NG 15247
 HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 12.5 DENSITY ~ FT. 5240 GROSS WEIGHT ~ LB. 8090 LONG. C.G. ~ IN. 200.8 (AFT) ROTOR SPEED ~ RPM 324.0 SKID HEIGHT ~ FT. 7 TO 15 WHEELS 6 (DOWN)

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED (WIND VELOCITY)
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

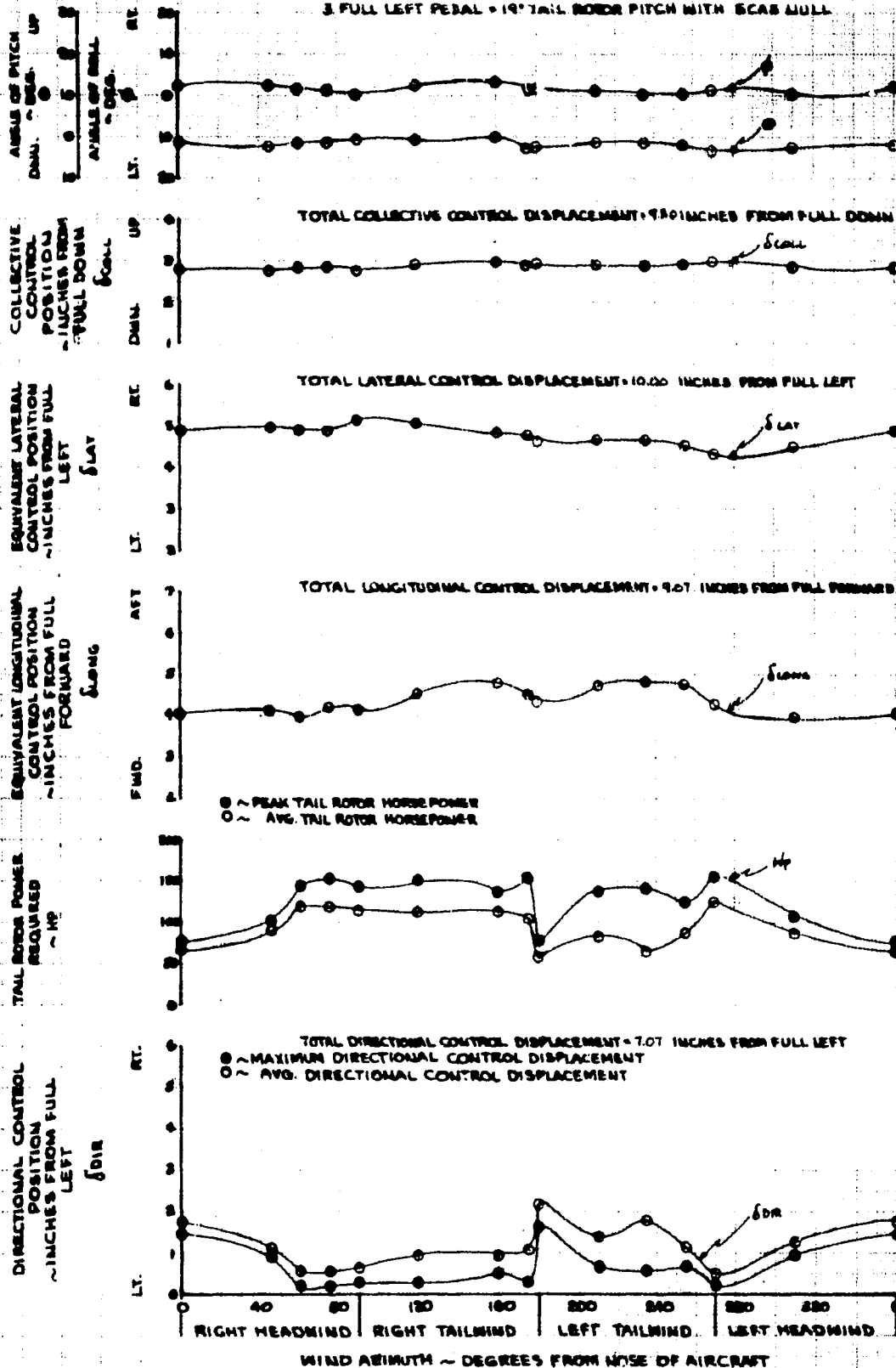


FIGURE No 118
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 4615247
 MVV SCOUT CONFIGURATION WITH ROCKET FOOT FAIRINGS REMOVED

AIR SPEED ~ KTS 170 2210
 DENSITY ~ LB/FT³ 0.000
 ALTITUDE ~ FT 8000
 GROSS WEIGHT ~ LB 2000 (AP)
 LONG. C.G. ~ IN 254.0
 ROTOR SPEED ~ RPM 7 TO 15
 SKID HEIGHT ~ FT 0.004653
 THRUST ~ CT

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEPAL + 19° TAIL ROTOR PITCH WITH SCAS NULL

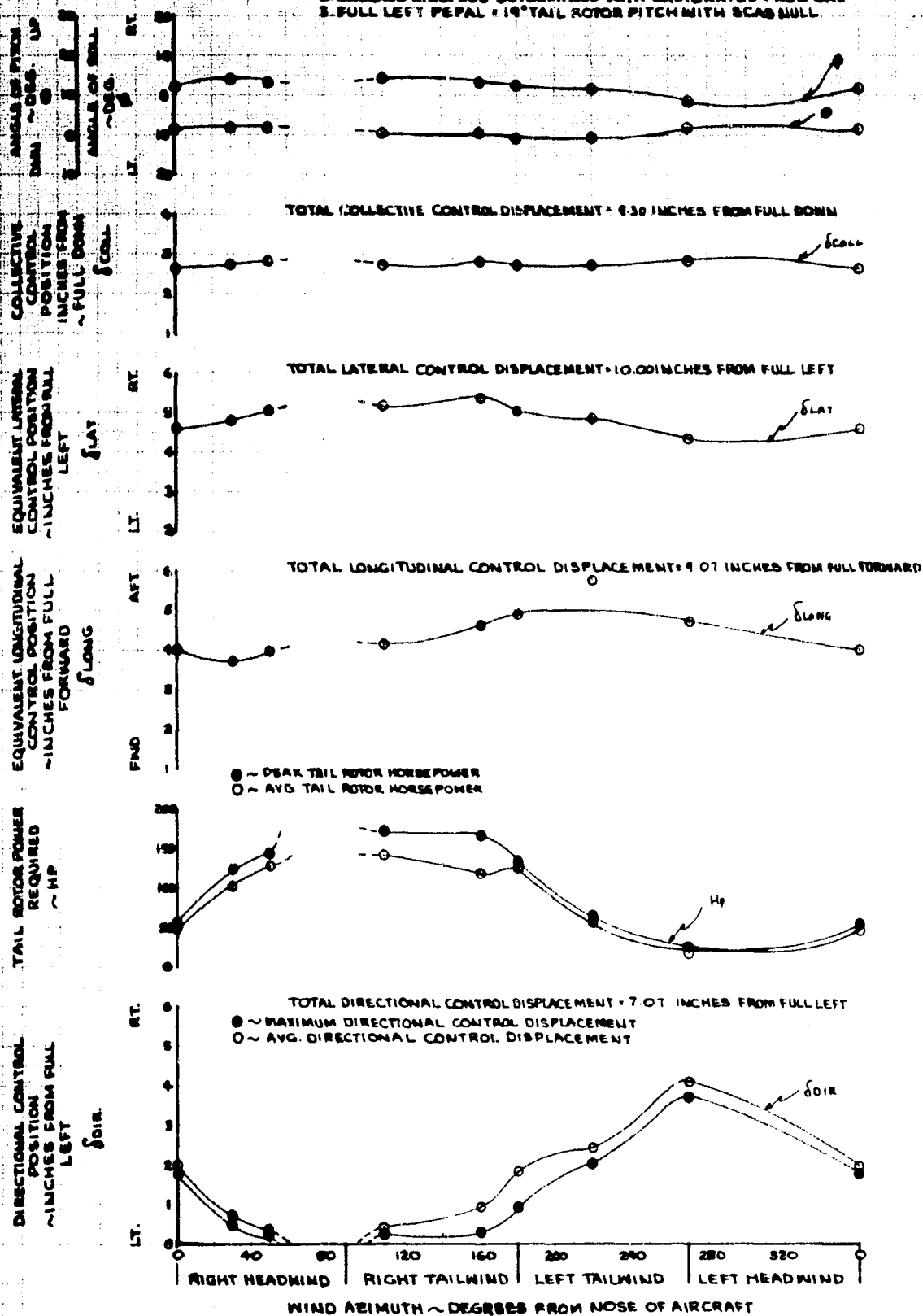


FIGURE No. 119
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 4618247
 HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

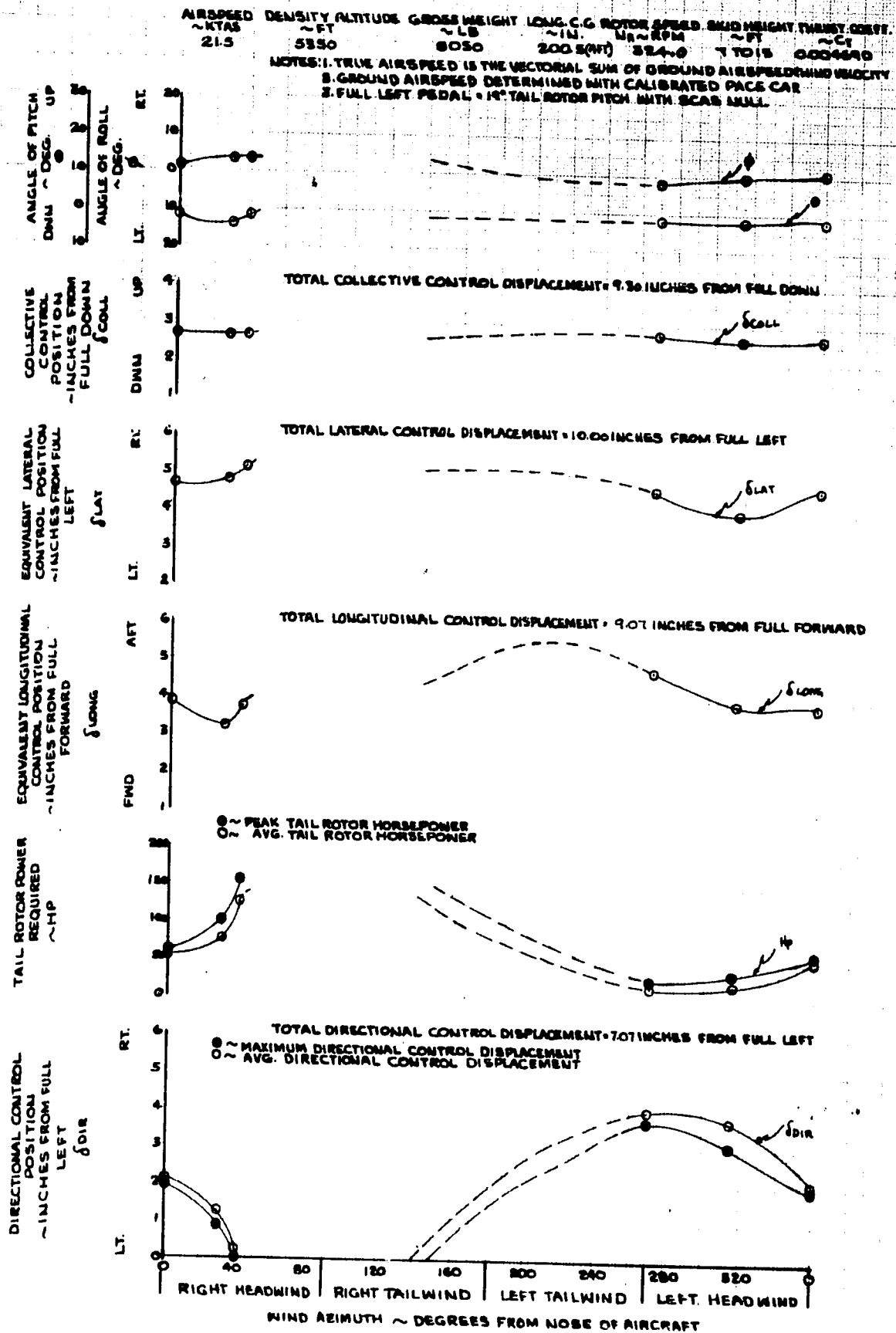


FIGURE NO. 120
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 6415247
 HVT SCOUT CONFIGURATION WITH ROCKET PODS REMOVED

AIR SPEED ~ KTS 28.5 DENSITY ALTITUDE ~ FT 5350 GROSS WEIGHT ~ LB 8040 LONG. C.G. ~ IN 200.5 (AFT) ROTOR SPEED N_2 ~ RPM 334.0 SLID HEIGHT ~ FT 7.015 THROST COEFF ~ C_T 0.004684

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED AND WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH WITH SCAS NULL

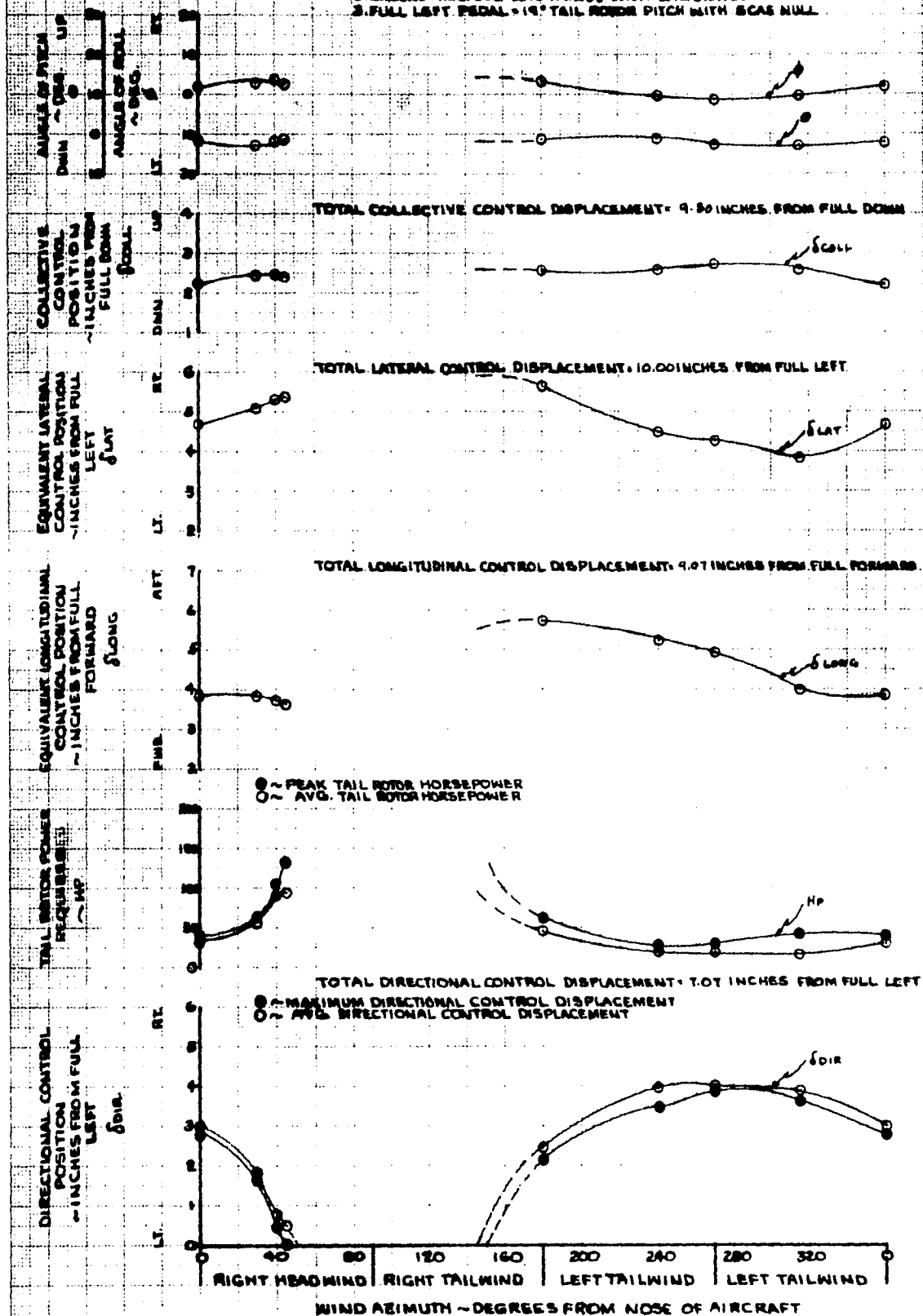


FIGURE 121
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AN-12 USA 1615267
 HVY SCOUT CONFIGURATION WITH ROCKET FOD FIBERS REMOVED

AIRSPED ~KTAS 24.8 DENSITY ~FT 5370 ALTITUDE ~FT 1000 GROSS WT ~LB 200.5(M) LONG. C.G. ~IN 324.0 ROTOR SPEED ~RPM 71815 TAIL HEIGHT ~FT 8004000

NOTES: 1. TAIL AIRFIELD IS THE VERTICAL DPH OF THE GROUND AIRFIELD QIND VELOCITY
 2. GROUND AIRSPED DETERMINED WITH CALIBRATED PRO CAR
 3. FULL LEFT FROM 115° TAIL ROTOR PITCH WITH SCAB MULL

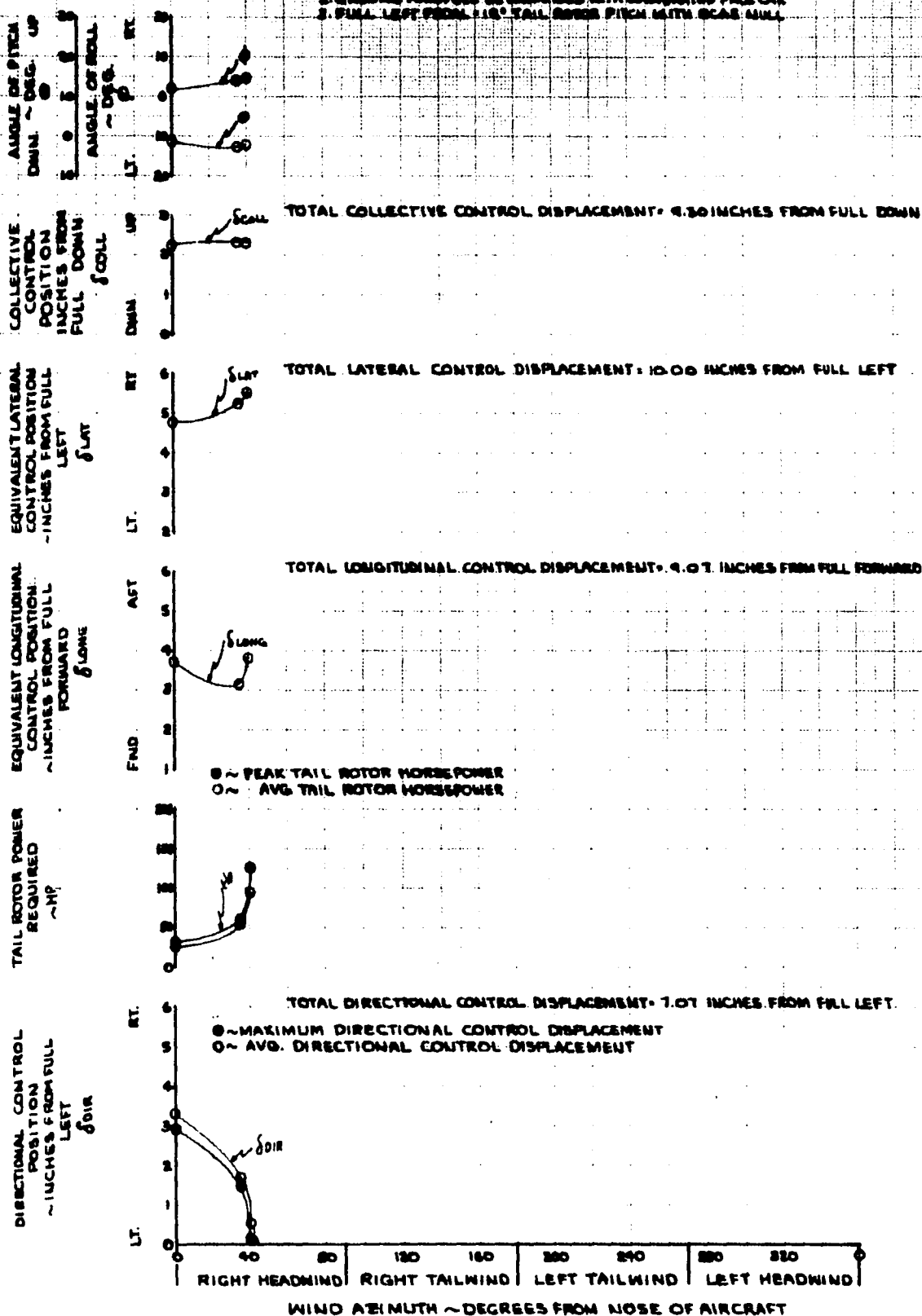


FIGURE No. 122
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 4613247
 HMY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED DENSITY ALTITUDE GROSS WEIGHT LONG. C.G. ROTOR SPEED SMD WEIGHT THRUST COEFF.
 ~KTAS ~FT ~LB ~IN. N_R ~RPM ~FT. ~C_T
 4.5 10950 7550 195.6 (440) 324.0 77015 0.005094

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 19° TAIL ROTOR PITCH WITH SCAS NULL

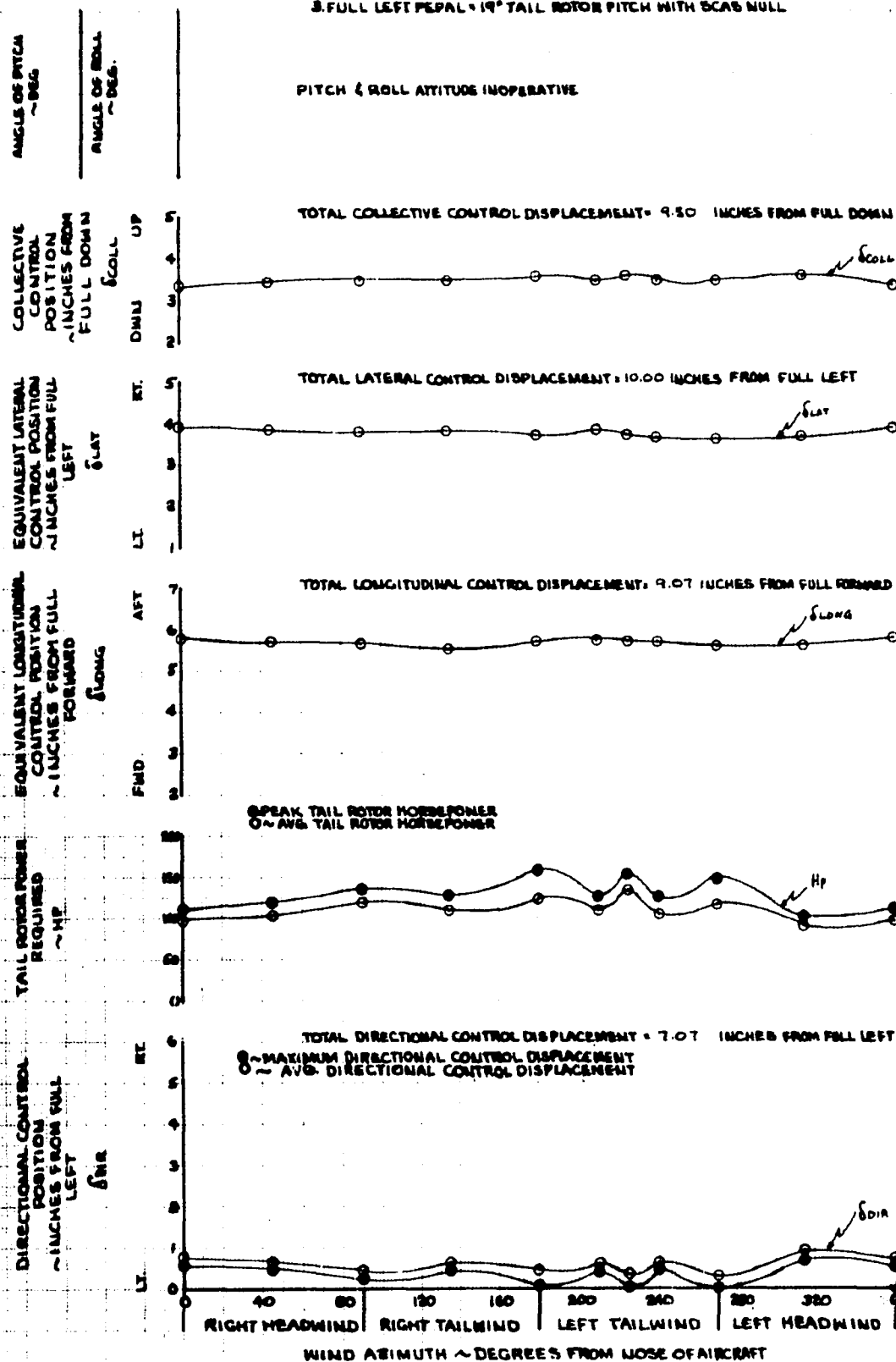


FIGURE NO. 123
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA F613 247
 HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTAS	DENSITY ALTITUDE ~ FT	GROSS WEIGHT ~ LB	LONG. C.C. ~ IN	ROTOR SPEED ~ RPM	SKID HEIGHT ~ FT	THRUST COEFF ~ C _T
8.5	11090	7210	195.4 (411)	324.0	7.1015	0.005018

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED & WIND VELOCITY
 2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
 3. FULL LEFT PEDAL - 19° TAIL ROTOR PITCH WITH SCAS NULL

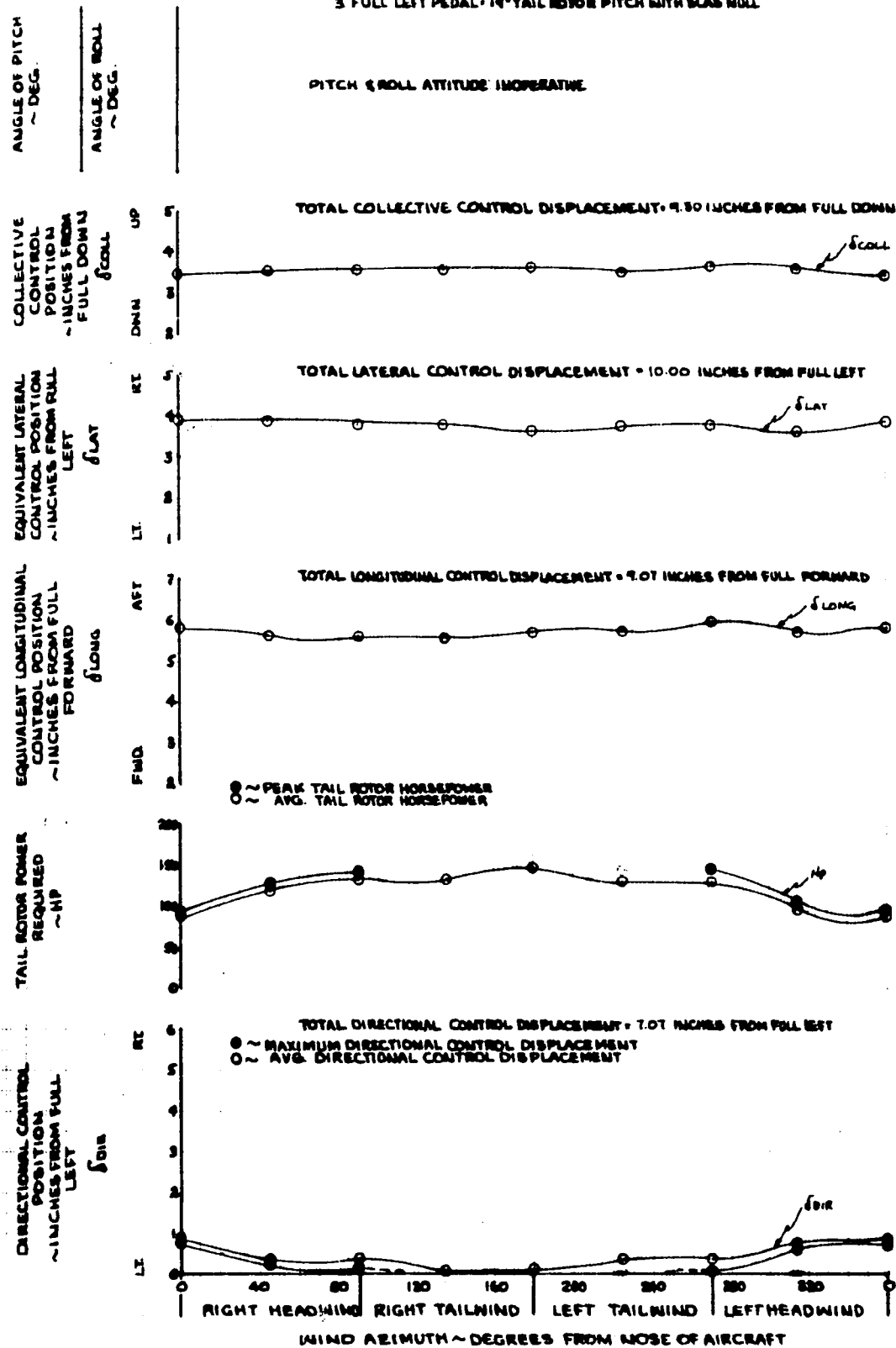


FIGURE NO. 124
STATIC TRIM STABILITY IN GROUND EFFECT AT VARIOUS WIND AZIMUTH
 AH-1G USA 94615247
 HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED ~ KTAS	DENSITY ALTITUDE ~ FT	GROSS WEIGHT ~ LB	LONG. C.G. ~ IN.	ROTOR SPEED N _R ~ RPM	SKID HEIGHT ~ FT.	THRUST COEFF. ~ C _T
12.5	11320	TOTO	195.3(MID)	324.0	7 TO 15	0.004955

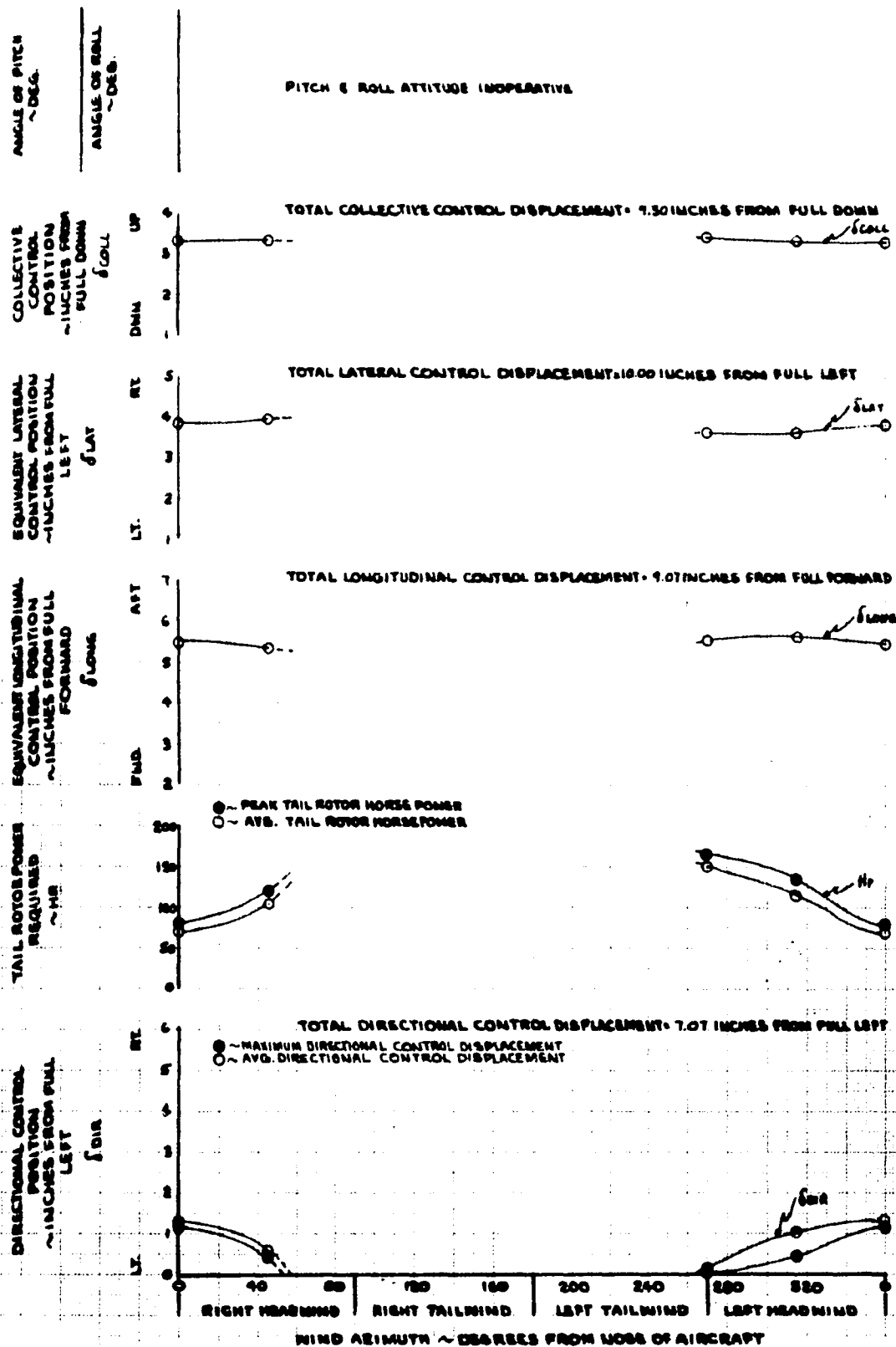


FIGURE NO 125 SIDWARD & REARWARD FLIGHT

AN-1G USA #615267
HVV. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
LANDING GEAR CROSS TUBE FAIRINGS REMOVED

DENSITY ALTITUDE H ₀ ~ FEET	GROSS WEIGHT ~ LBS	LONG. C.G. ~ IN.	ROTOR SPEED NR ~ RPM	SKID HEIGHT ~ FT.	WING AREA ~ SQ. FT.
8030	8000	201.1 (AFT)	524.0	7.1015	204.645

NOTES: 1. TRUE AIRSPEED IS THE VECTORIAL SUM OF GROUND AIRSPEED AND WIND VELOCITY
2. GROUND AIRSPEED DETERMINED WITH CALIBRATED PACE CAR
3. FULL LEFT PEDAL = 19° TAIL ROTOR PITCH SCALE NULL

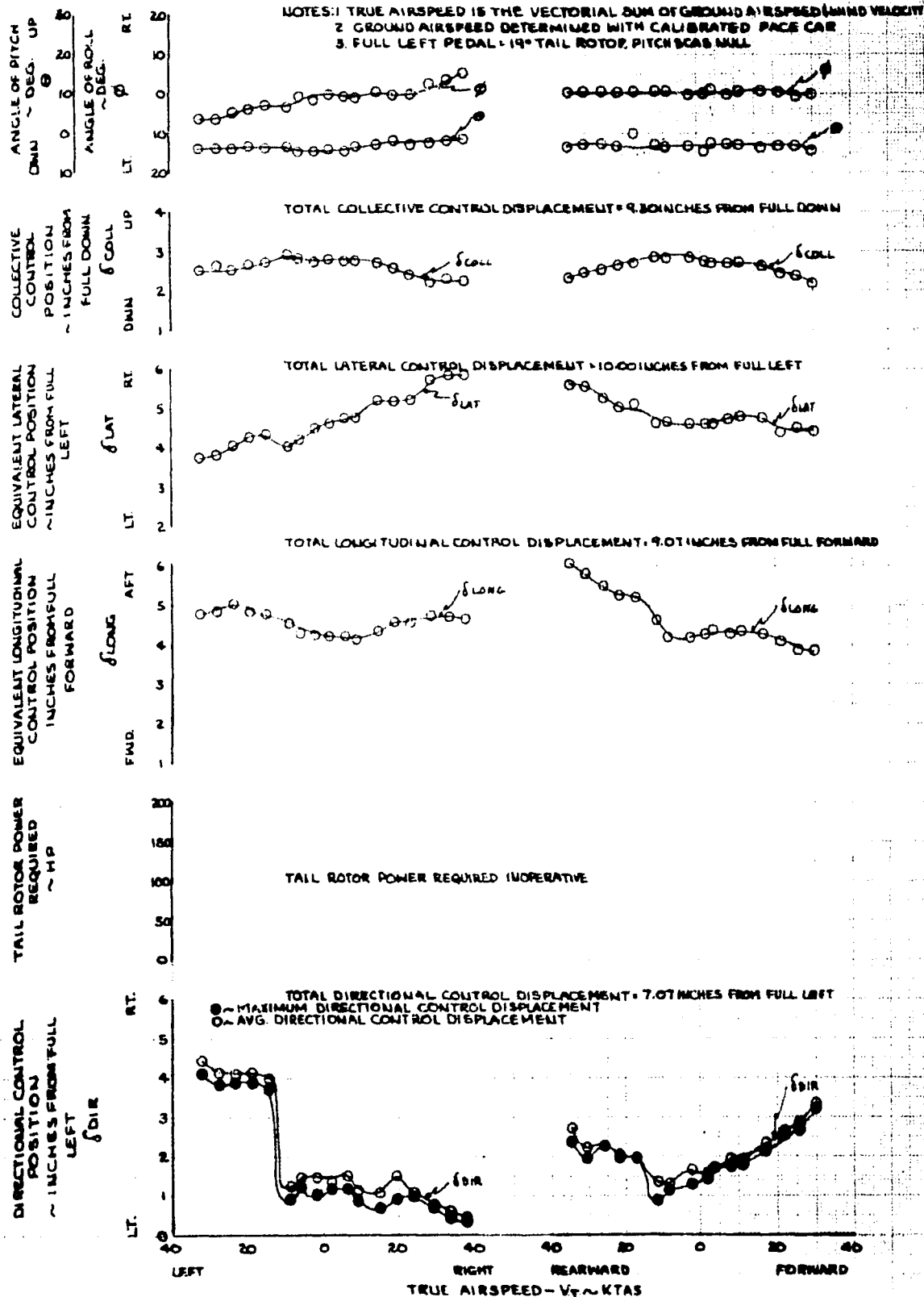


FIGURE NO. 126
LONGITUDINAL DYNAMIC STABILITY SUMMARY
AH-1G USA S/N 715695

CONFIG	AVG G.W. ~LB	AVG ALT H _D ~FT	AVG LONG C.G. ~IN	SCAS	V _{MIN} POWER (LEVEL FLT)			.8 V _H (LEVEL FLT)			V _H (LEVEL FLT)		
					ζ	DESCRIP	AIRSPD ~ CAS	ζ	DESCRIP	AIRSPD ~ CAS	ζ	DESCRIP	AIRSPD ~ CAS
CLEAN	7660	5000	190.5 (FWD)	ON	NA NA	DEAD BEAT	63	NA NA	DEAD BEAT	106	NA NA	DEAD BEAT	137
				OFF	NA NA	DEAD BEAT		NA NA	DEAD BEAT		NA NA	DEAD BEAT	
CLEAN	7540	4000	201 (AFT)	ON	.26 1.7	HEAVILY DAMPED	65	NA NA	DEAD BEAT	108	NA NA	DEAD BEAT	142
				OFF	.05 .9	HEAVILY DAMPED		.09 .3	LIGHTLY DAMPED		.16 1.4	HEAVILY DAMPED	
HEAVY HOG ☆	7740	4300	201 (AFT)	ON	NA NA	DEAD BEAT	62	NA NA	DEAD BEAT	105	.28 1.45	HEAVILY DAMPED	150
				OFF	.08 1.1	UNDAMPED		.02 1.3	UNDAMPED		.08 .9	HEAVILY DAMPED	
HEAVY HOG ☆ ☆	9340	4400	200 (AFT)	ON	NA NA	DEAD BEAT	65	NA NA	DEAD BEAT	104	NA NA	DEAD BEAT	132
				OFF	NF NF	NF		NF NF	NF		.06 .4	LIGHTLY DAMPED	
HEAVY HOG ☆	7730	15000	201 (AFT)	ON	.06 1.2	HEAVILY DAMPED	56	NA NA	DEAD BEAT	86	NA NA	DEAD BEAT	105
				OFF	NF NF	NF		NF NF	NF		NA NA	UNDAMPED	
☆ ☆ HEAVY SCOUT	9310	4500	200 (AFT)	ON	NF NF	NF	NF	NA NA	DEAD BEAT	104	NA NA	DEAD BEAT	140

CONFIG	AVG G.W. ~LB	AVG ALT H _D ~FT	AVG LONG C.G. ~IN	SCAS	V _{MIN} (DIVE)			V _{MAX} (R/C)			V _{MIN} (R/D)		
					ζ	DESCRIP	AIRSPD ~ CAS	ζ	DESCRIP	AIRSPD ~ CAS	ζ	DESCRIP	AIRSPD ~ CAS
CLEAN	7660	5000	190 (FWD)	ON	NA NA	DEAD BEAT	150	NA NA	DEAD BEAT	60	NA NA	DEAD BEAT	72
				OFF	NA NA	DEAD BEAT		NA NA	DEAD BEAT		NA NA	DEAD BEAT	
CLEAN	7540	4000	201 (AFT)	ON	.49 1.8	HEAVILY DAMPED	150	NA NA	DEAD BEAT	65	NA NA	DEAD BEAT	70
				OFF	.10 .6	HEAVILY DAMPED		.09 .5	LIGHTLY DAMPED		.10 .6	HEAVILY DAMPED	
HEAVY HOG ☆	7740	4300	201 (AFT)	ON	NA NA	DEAD BEAT	170	NA NA	DEAD BEAT	68	NA NA	DEAD BEAT	69
				OFF	.13 1.1	LIGHTLY DAMPED		.09 .5	LIGHTLY DAMPED		NA NA	DEAD BEAT	
HEAVY HOG ☆ ☆	9340	4400	200 (AFT)	ON	NF NF	NF	NF	NA NA	DEAD BEAT	62	NF NF	NF	NF
				OFF	NF NF	NF		.15 .5	LIGHTLY DAMPED		NF NF	NF	
☆ ☆ HEAVY SCOUT	9310	4500	200 (AFT)	ON	NA NA	DEAD BEAT	170	NA NA	DEAD BEAT	60	NF NF	NF	NF

NOTE: ALL APPLICABLE NOTES ARE PRESENTED ON FIGURE 150.

FIGURE NO.127 AFT LONGITUDINAL PULSE SCAS ON

AH-1G USAF 6715695
CLEAN CONFIGURATION

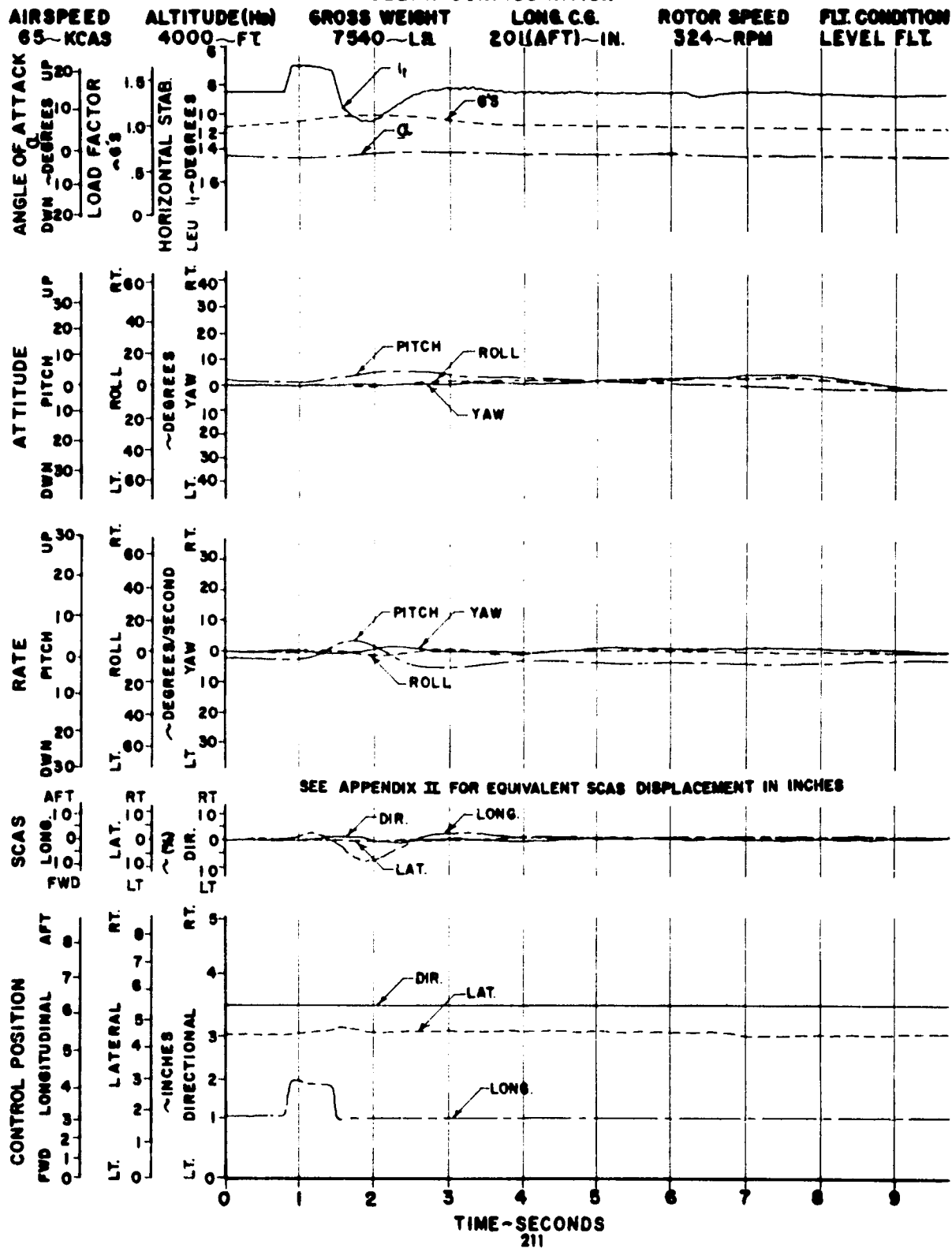


FIGURE NO. 128 AFT LONGITUDINAL PULSE SCAS ON

AH-1G USAF 6715695
CLEAN CONFIGURATION

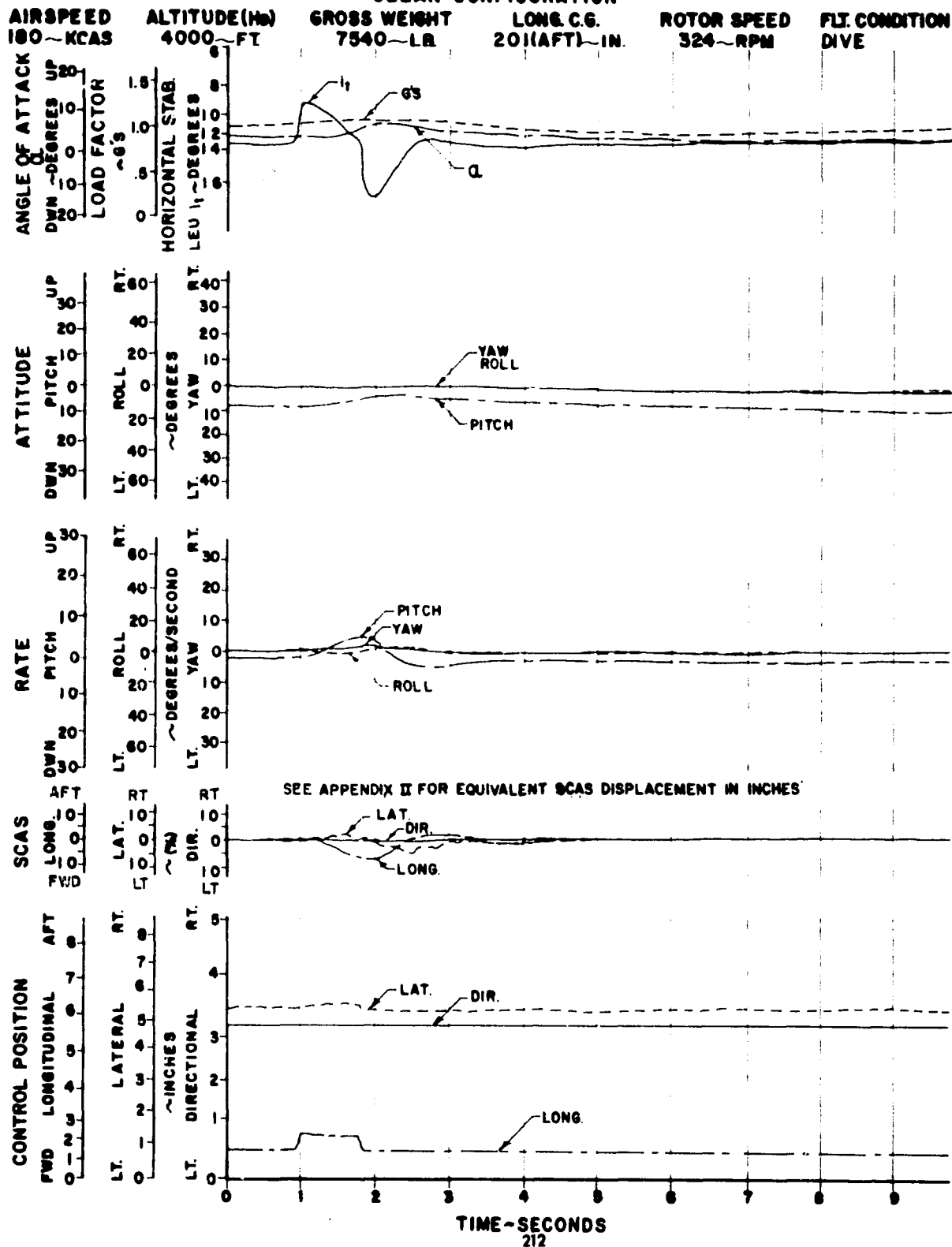
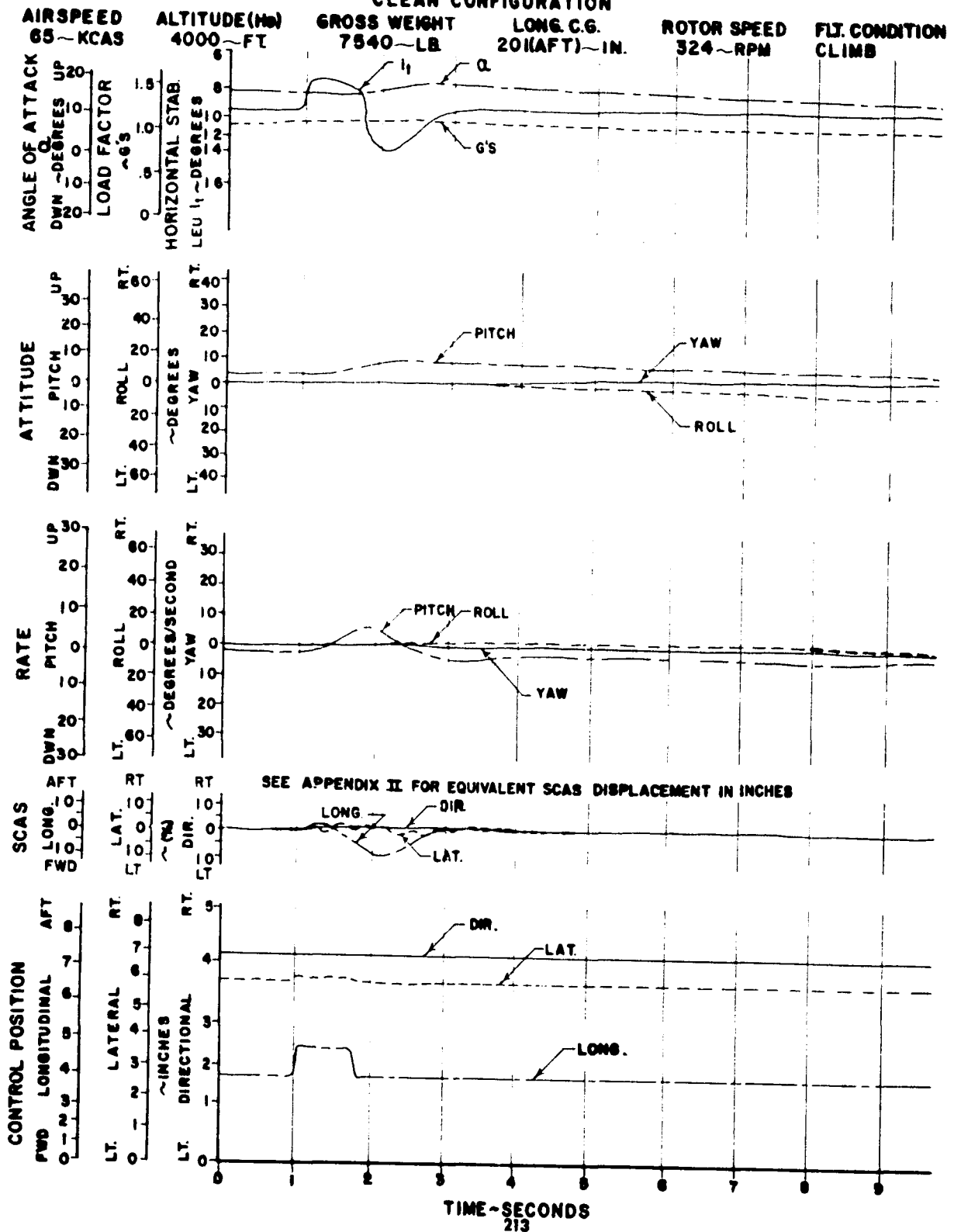


FIGURE NO. 129 AFT LONGITUDINAL PULSE SCAS ON

AH-1G USAF 6715695
CLEAN CONFIGURATION



AH-1G USA 46715695
CLEAN CONFIGURATION

Graph showing Angle of Attack (in degrees) versus Load Factor (in g's) for a 1000 lb aircraft. The graph includes curves for l_1 , $g's$, and ρ . The horizontal axis is labeled "LOAD FACTOR - g's" and ranges from 0 to 1.5. The vertical axis is labeled "ANGLE OF ATTACK - DEGREES" and ranges from 0 to 20. A dashed line represents the "HORIZONTAL STAB".



FIGURE NO.131 AFT LONGITUDINAL PULSE SCAS ON

AH-1G USAF 6718895

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 105 ~ KCAS ALTITUDE (Ht) 4300 ~ FT GROSS WEIGHT 7740 ~ LB LONG. C.G. 20 (AFT) ~ IN. ROTOR SPEED 324 ~ RPM FLT. CONDITION LEVEL FLT.

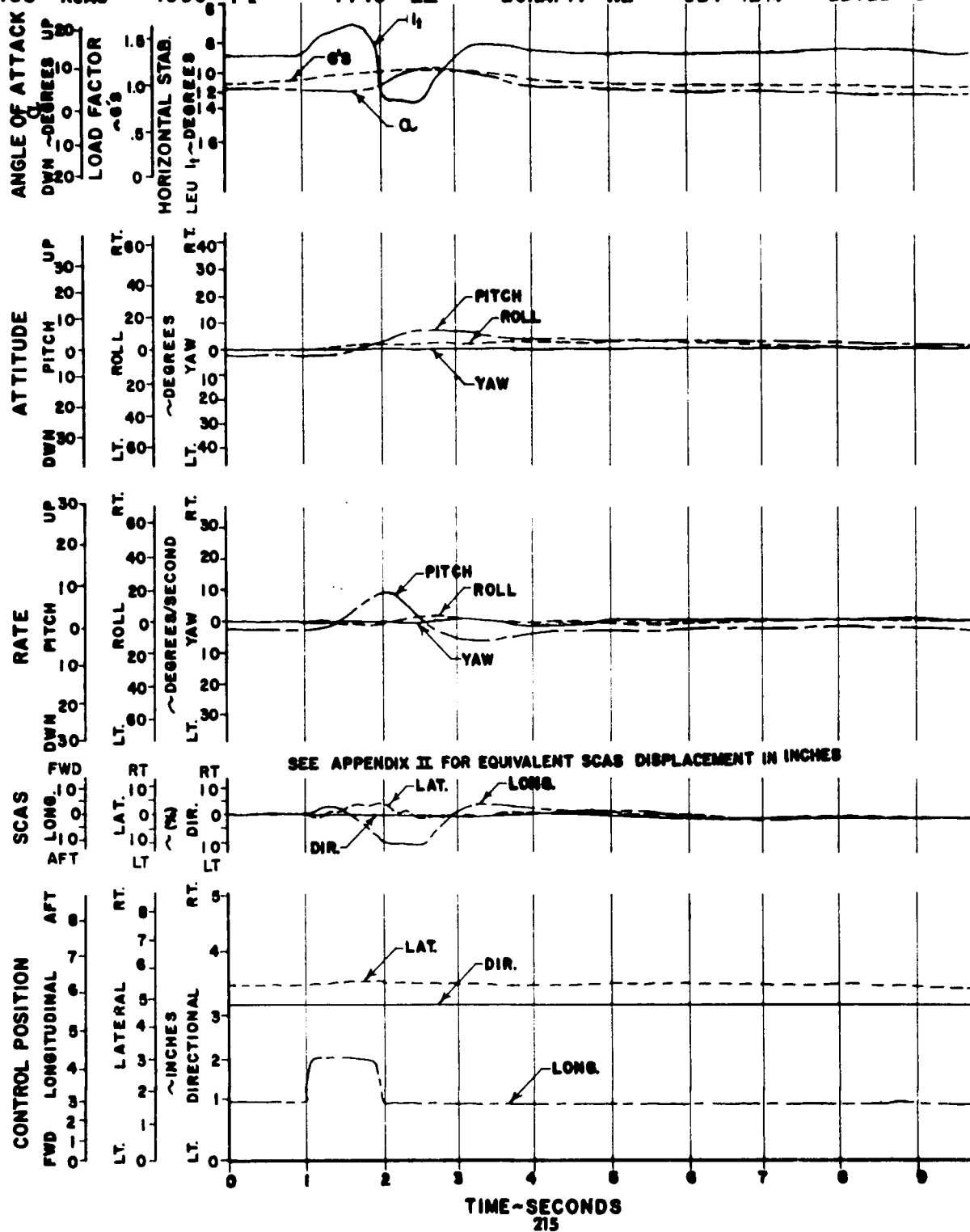
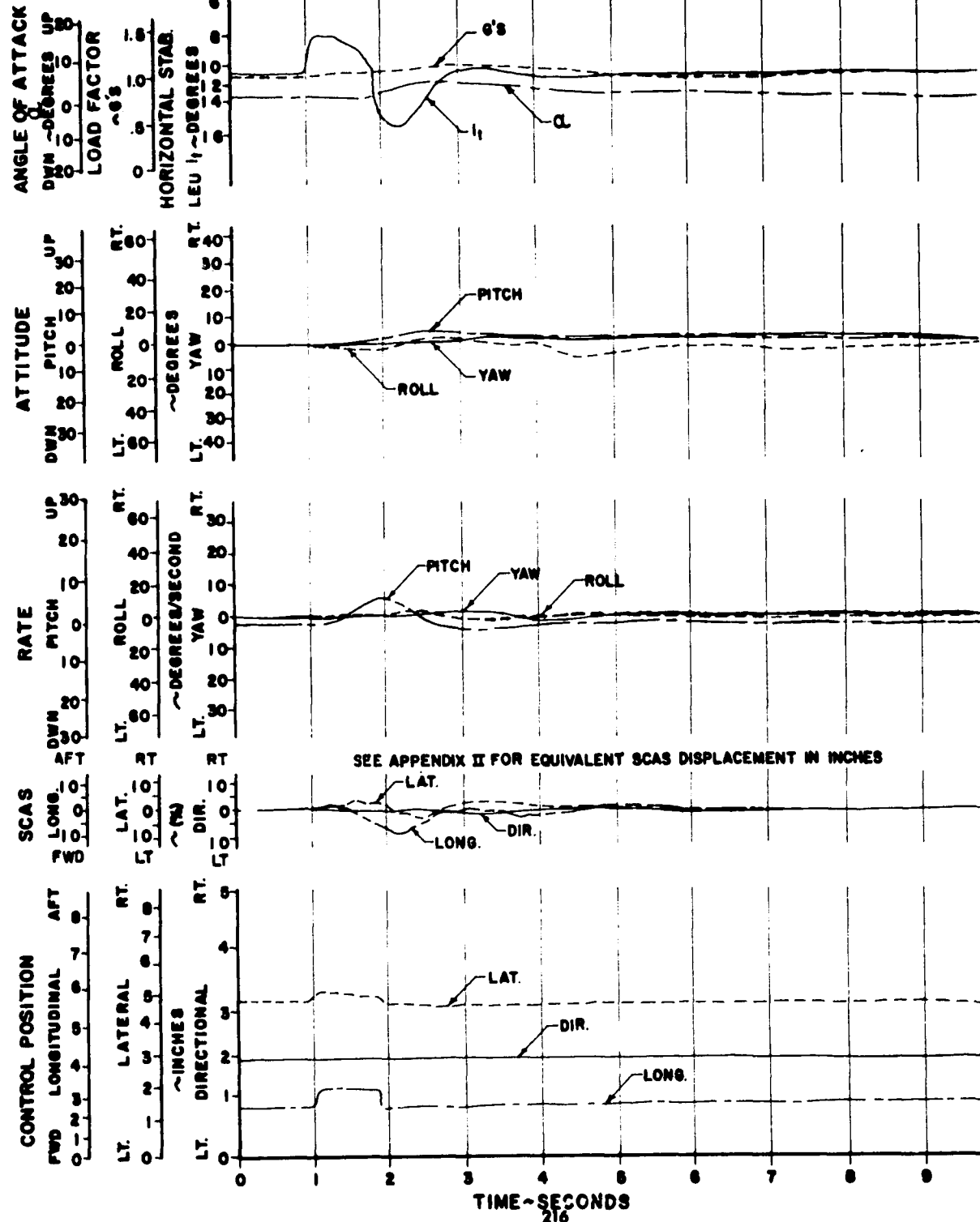


FIGURE NO. 132 AFT LONGITUDINAL PULSE SCAS ON

AH-1G USAF 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 105~KAS ALTITUDE(Hm) 15000~FT GROSS WEIGHT 7730~LB LONG.C.G. 20(AFT)~IN. ROTOR SPEED 324~RPM FLZ CONDITION LEVEL FLT.

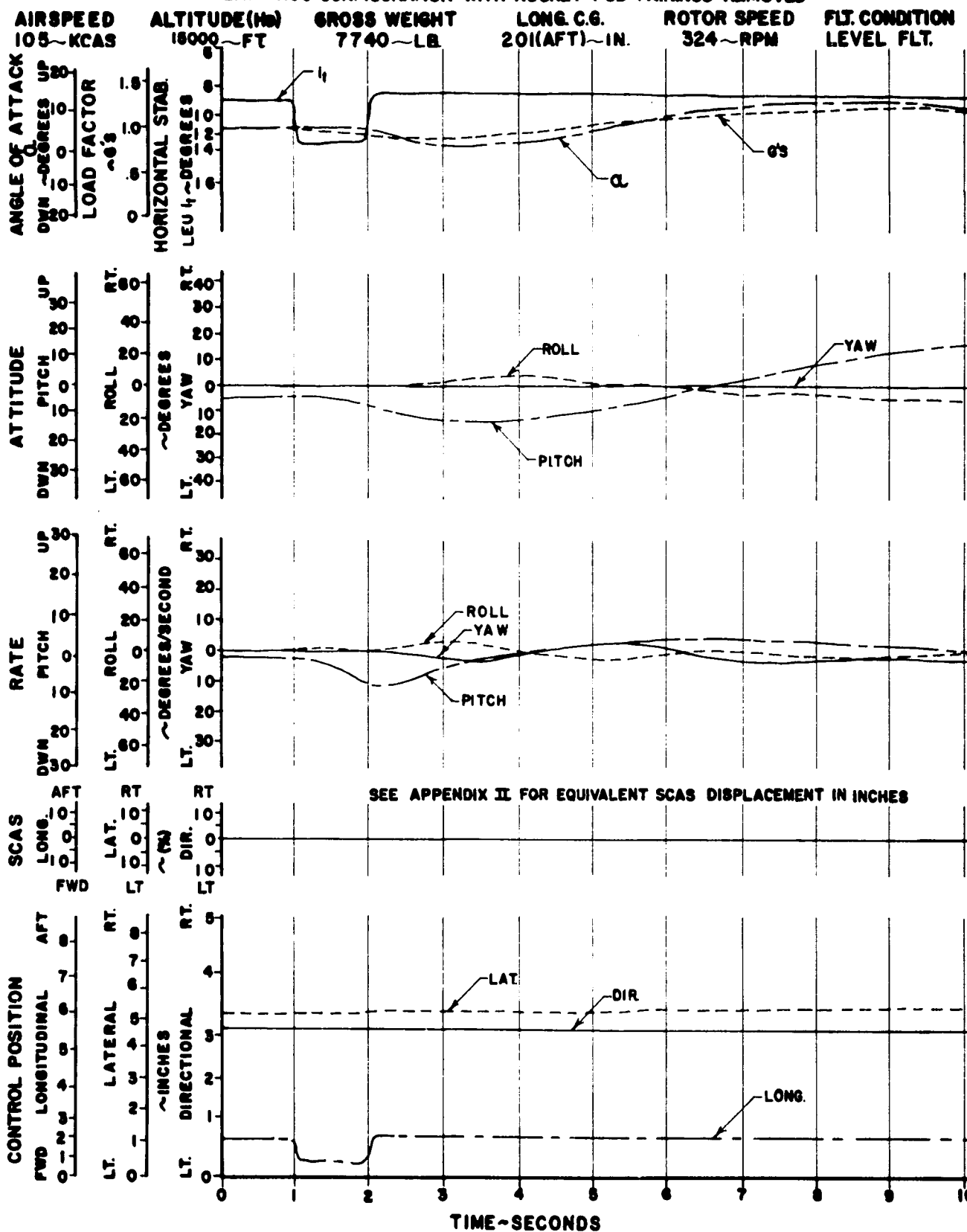


TIME~SECONDS
216

FIGURE NO.133 FWD LONGITUDINAL PULSE SCAS OFF

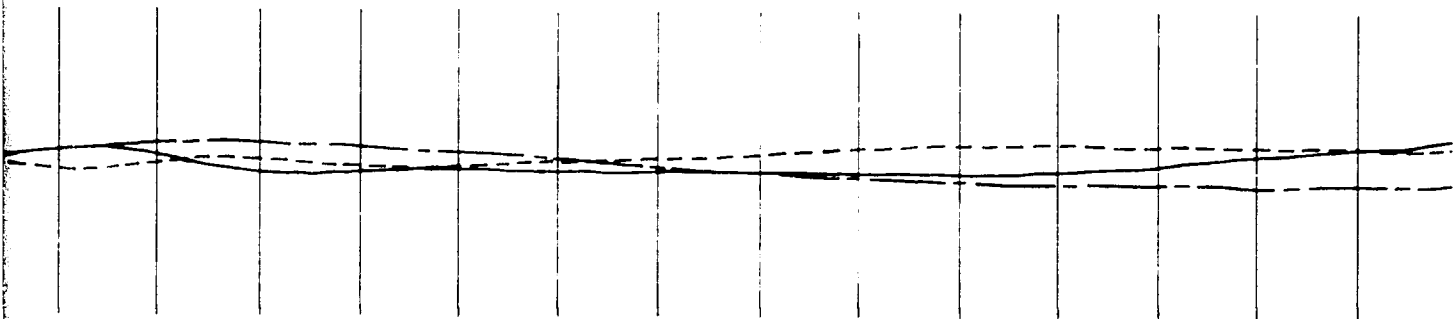
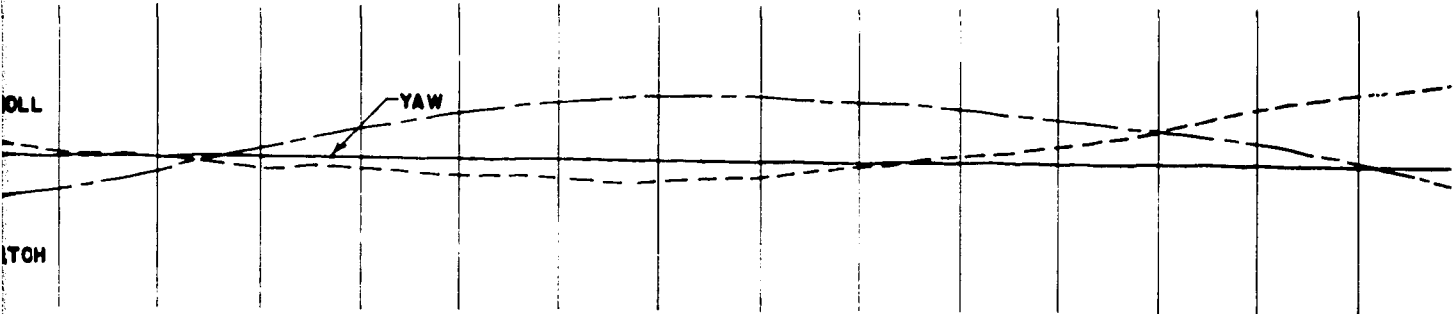
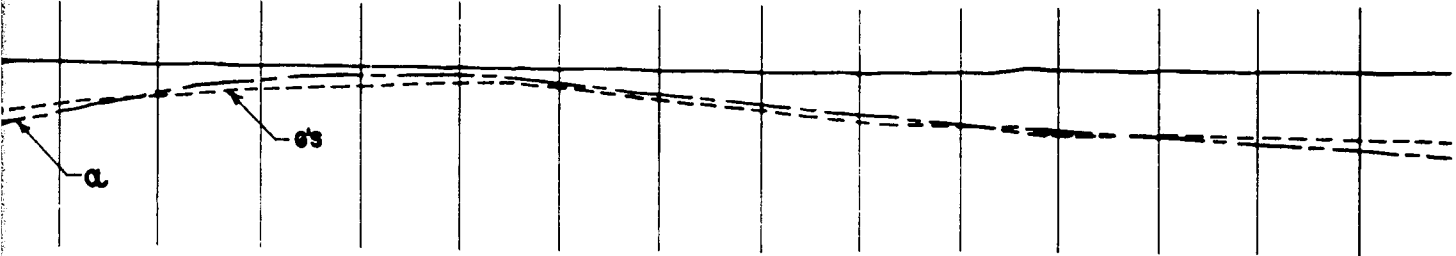
AH-1G USA 46715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

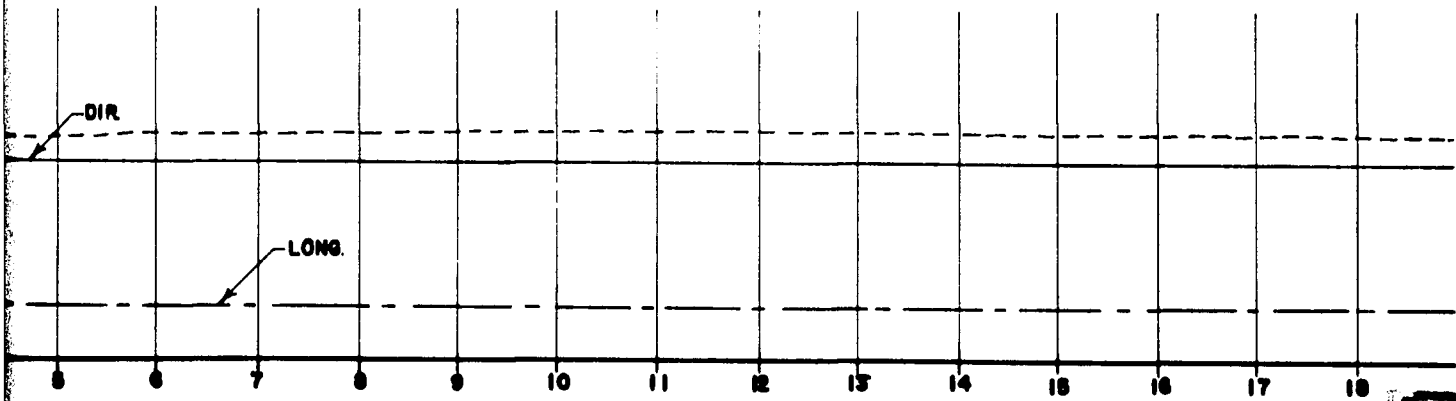


0.133
LSE SCAS OFF

3895
WCKET POD FAIRINGS REMOVED
G.C.G. ROTOR SPEED FLT. CONDITION
FTI)~IN. 324~RPM LEVEL FLT.



EQUIVALENT SCAS DISPLACEMENT IN INCHES



ONDS

FIGURE NO. 154
LATERAL DYNAMIC STABILITY SUMMARY
 AH-1G USA S/N 715695
 LEFT AND RIGHT CONTROL PULSES

CONFIG	AVG GW -LB	AVG ALT H _D - FT	AVG LONG C G - IN	SCAS	V _{MIN} POWER (LEVEL FLT)			V _H (LEVEL FLT)			V _H (LEVEL FLT)		
					ω	DESCRIP	AIRSPEED - CAS	ω	DESCRIP	AIRSPEED - CAS	ω	DESCRIP	AIRSPEED - CAS
CLEAN	7300	4100	201 (AFT)	ON	.15 1.3	HEAVILY DAMPED	65	.57 1.8	HEAVILY DAMPED	106	NA NA	DEAD BEAT	142
				OFF	.14 .8	HEAVILY DAMPED		.19 .6	HEAVILY DAMPED		.25 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	7620	3700	201 (AFT)	ON	NA NA	DEAD BEAT	60	.05 1.3	HEAVILY DAMPED	106	NA NA	DEAD BEAT	150
				OFF	.29 .6	HEAVILY DAMPED		.27 .1	LIGHTLY DAMPED		.21 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	8360	4500	195 (MID)	ON	.03 .9	HEAVILY DAMPED	60	.06 1.3	HEAVILY DAMPED	104	NA NA	DEAD BEAT	138
				OFF	.17 .1	LIGHTLY DAMPED		.24 .1	LIGHTLY DAMPED		.27 .1	LIGHTLY DAMPED	
HEAVY HOG ☆ ☆	8680	3600	195 (MID)	ON	.17 1.3	HEAVILY DAMPED	62	.36 1.6	HEAVILY DAMPED	103	NA NA	DEAD BEAT	138
				OFF	.23 .3	LIGHTLY DAMPED		.24 .1	LIGHTLY DAMPED		.27 .1	LIGHTLY DAMPED	
HEAVY HOG ☆ ☆	9270	4300	200 (AFT)	ON	NF NF	NF	NF	.20 1.2	HEAVILY DAMPED	104	NA NA	DEAD BEAT	132
				OFF	NF NF	NF		NF NF	.25 .1		LIGHTLY DAMPED		
HEAVY HOG ☆	7690	15060	201 (AFT)	ON	.07 .9	HEAVILY DAMPED	55	NA NA	DEAD BEAT	66	NA NA	DEAD BEAT	102
				OFF	NF NF	NF		NF NF	.22 .1		LIGHTLY DAMPED		
☆ ☆ HEAVY SCOUT	9000	5000	200 (AFT)	ON	NF NF	NF	NF	NA NA	DEAD BEAT	103	.30 1.5	HEAVILY DAMPED	140

CONFIG	AVG GW LB	AVG ALT H _D - FT	AVG LONG C.G. - IN	SCAS	V _{LIMIT} (DIVE)			V _{MAX} (R/C)			V _{MIN} (R/D)		
					ω	DESCRIP	AIRSPEED - CAS	ω	DESCRIP	AIRSPEED - CAS	ω	DESCRIP	AIRSPEED - CAS
CLEAN	7300	4100	201 (AFT)	ON	.44 1.5	HEAVILY DAMPED	180	.20 1.3	HEAVILY DAMPED	65	NF NF	NF NF	NF
				OFF	.29 .1	LIGHTLY DAMPED		.26 .1	LIGHTLY DAMPED		NF NF	NF NF	
HEAVY HOG ☆	7620	3700	201 (AFT)	ON	NA NA	DEAD BEAT	170	NF NF	NF NF	NF	NF NF	NF NF	NF
				OFF	.27 0	NEUTRAL DAMPED		NF NF	NF NF		NF NF	NF NF	
HEAVY HOG ☆	8360	4500	195 (MID)	ON	NA NA	DEAD BEAT	170	.27 1.4	HEAVILY DAMPED	60	NA NA	DEAD BEAT	68
				OFF	.16 .2	LIGHTLY DAMPED		.25 .1	LIGHTLY DAMPED		.12 .8	HEAVILY DAMPED	
HEAVY HOG ☆ ☆	8680	3600	195 (MID)	ON	.14 1.2	HEAVILY DAMPED	180	.27 1.4	HEAVILY DAMPED	64	.07 1.1	HEAVILY DAMPED	74
				OFF	.22 .1	LIGHTLY DAMPED		.24 0	NEUTRAL DAMPED		NF NF	NF NF	
HEAVY HOG ☆ ☆	9270	4300	200 (AFT)	ON	.16 1.2	HEAVILY DAMPED	170	NF NF	NF NF	NF	NF NF	NF NF	NF

NOTE: ALL APPLICABLE NOTES ARE PRESENTED ON FIGURE 150.

FIGURE NO.135 RIGHT LATERAL PULSE SCAS ON

AH-1G USA 76715695
CLEAN CONFIGURATION

AIRSPED
65~KCAS

ALTITUDE(HA)
4100~FT

GROSS WEIGHT
7300~LB

LONG.C.G.
201(AFT)~IN.

ROTOR SPEED
324~RPM

FLI CONDITION
CLIMB

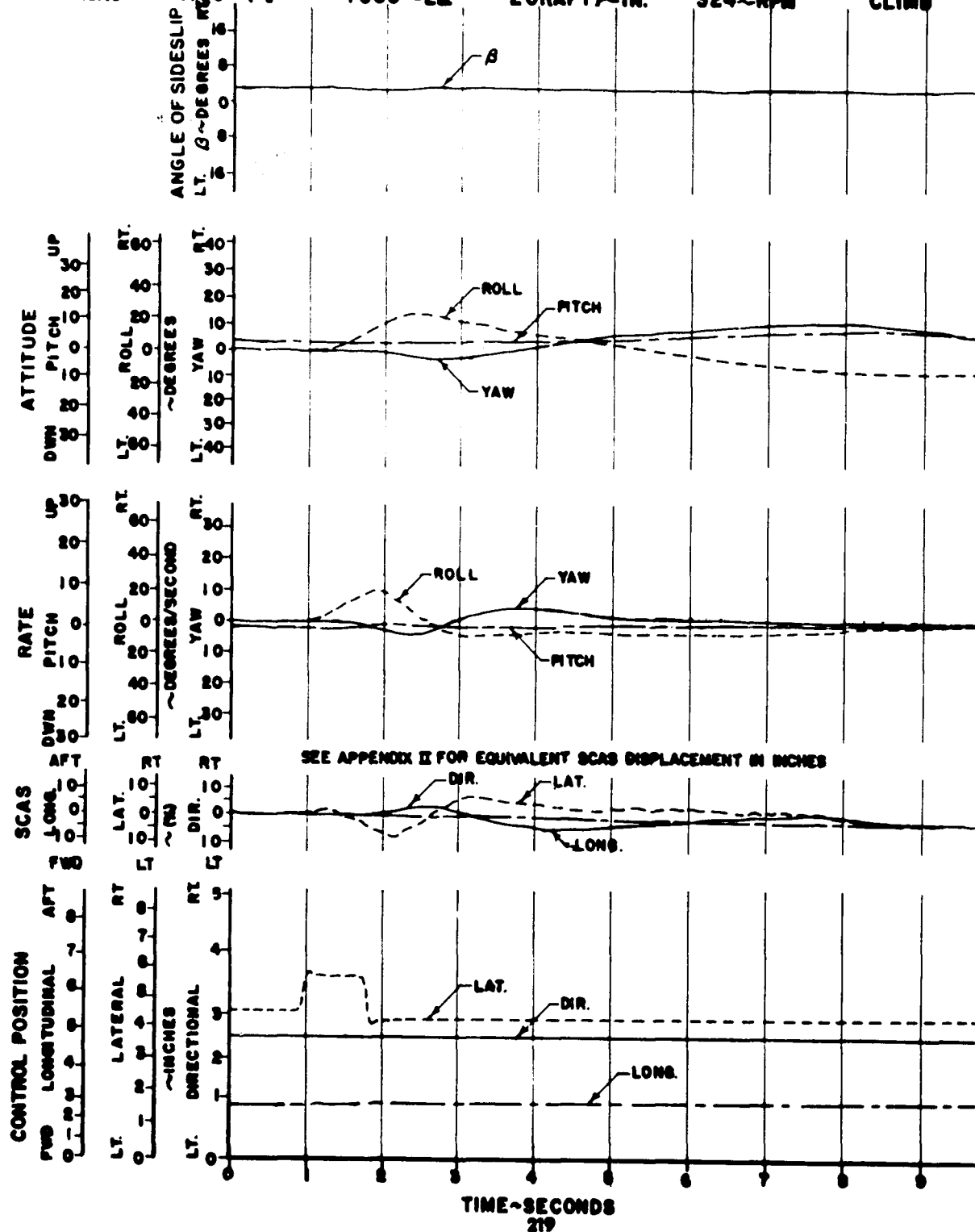


FIGURE NO. 136 RIGHT LATERAL PULSE SCAS ON

AH-1G USA 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPED 60~KCAS ALTITUDE(M) 4500~FT GROSS WEIGHT 8360~LB LONG.C.G. 195(MID)~IN. ROTOR SPEED 324~RPM FLT CONDITION LEVEL FLT.

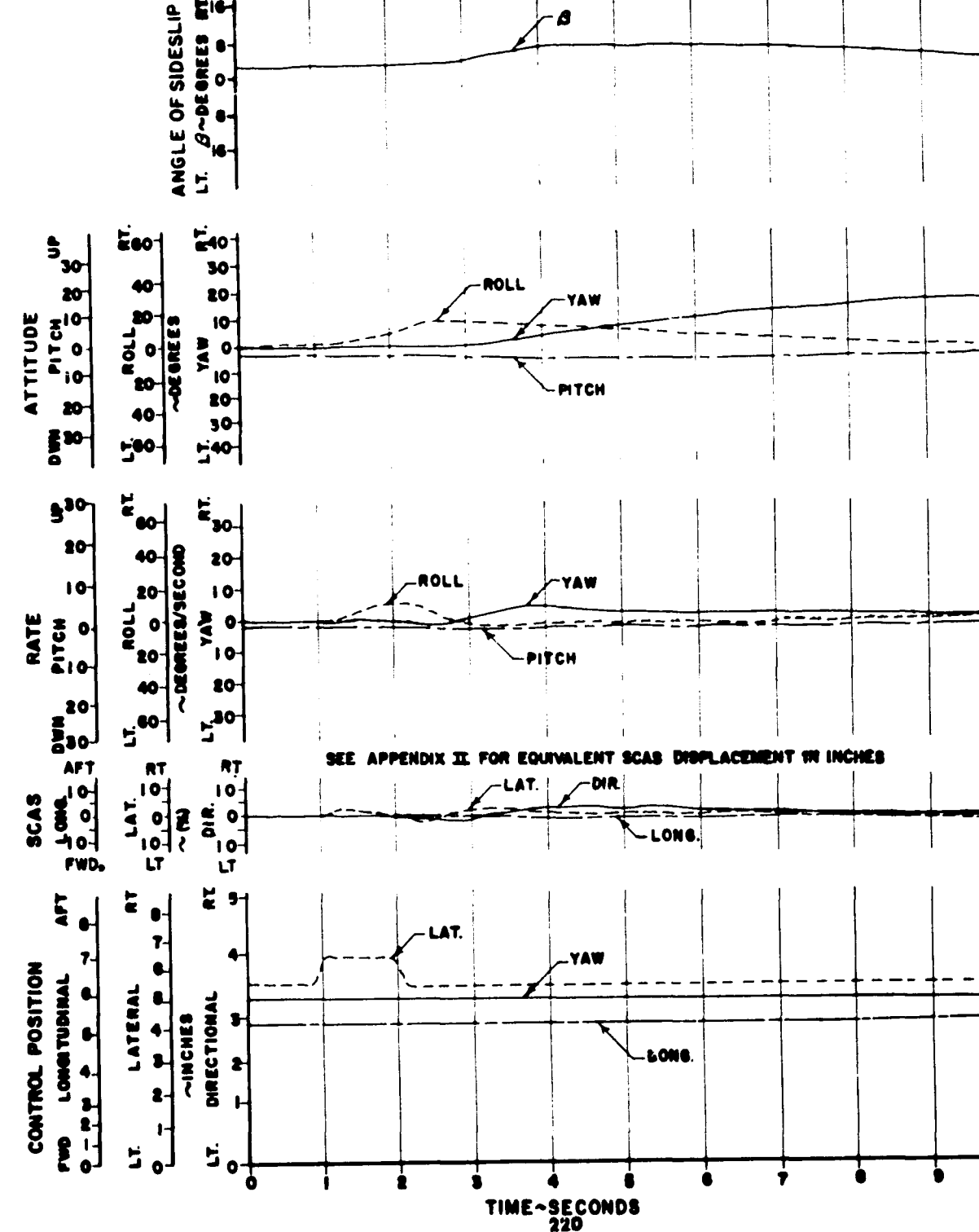


FIGURE NO. 137 RIGHT LATERAL PULSE SCAS ON

AH-1G USA 76715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 105~KCAS ALTITUDE(Hd) 3700~FT GROSS WEIGHT 7620~LB LONG.C.G. 201(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT.

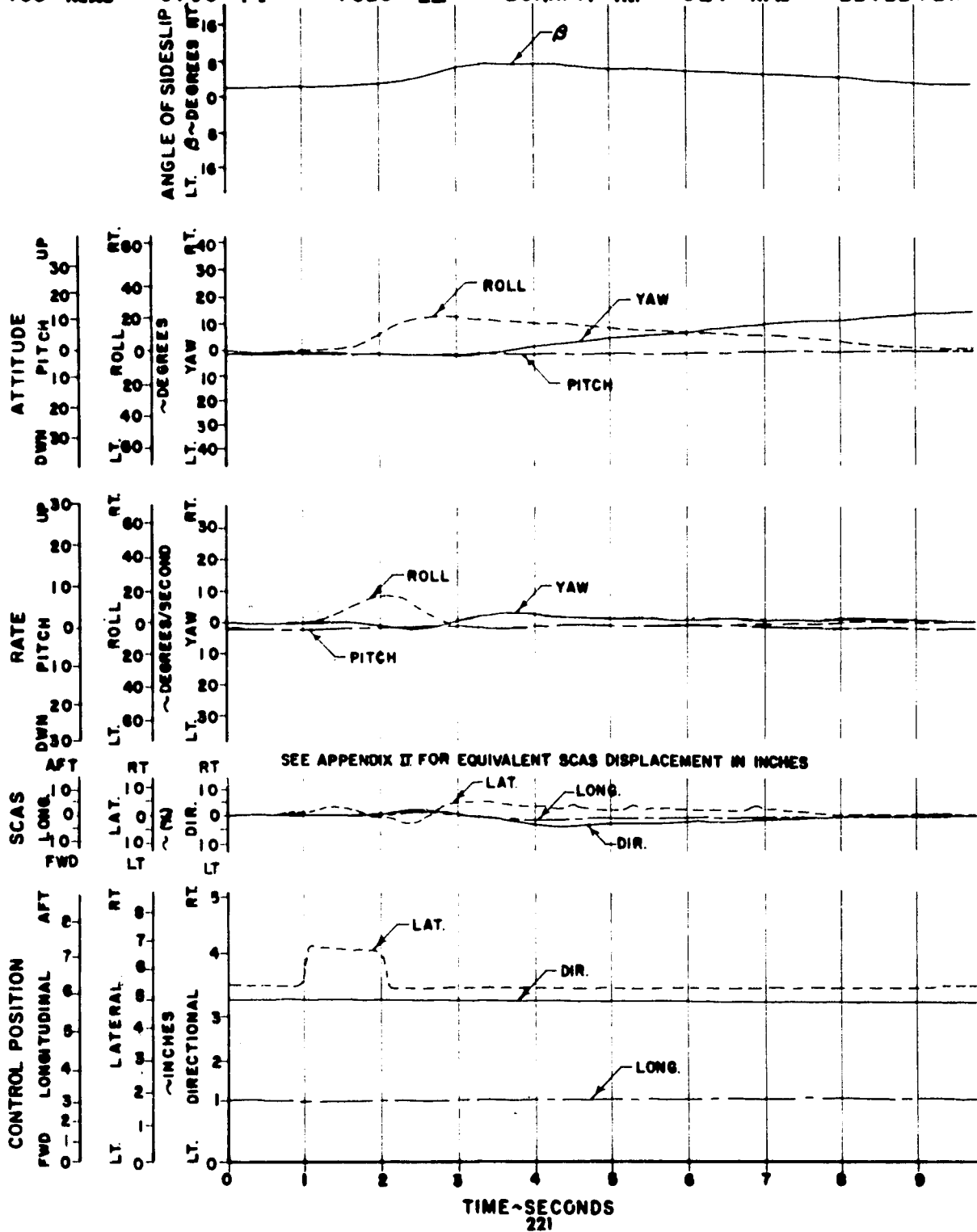


FIGURE NO.138 RIGHT LATERAL PULSE SCAS ON

AM-1G USA 56715695

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED 140~KCAS ALTITUDE(Ha) 5000~FT GROSS WEIGHT 9000~LB LONG.C.G. 200(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT

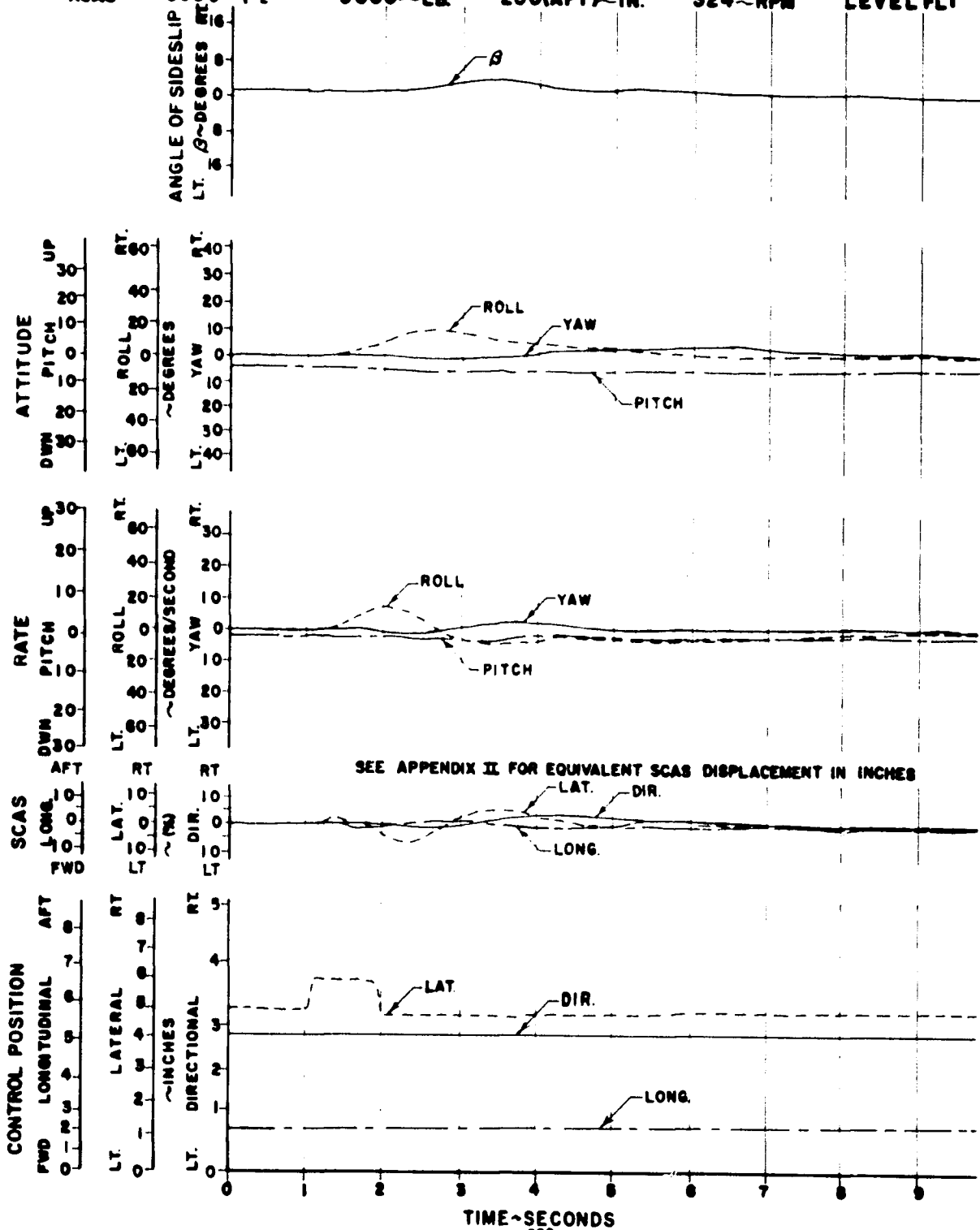


FIGURE NO.139 RIGHT LATERAL PULSE SCAS ON

AH-1G USA 56715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED
170~KCAS

ALTITUDE(Hm)
4300~FT

GROSS WEIGHT
9270~LB

LONG.C.G.
200(AFT)~IN.

ROTOR SPEED
324~RPM

FLT.CONDITION
DIV2

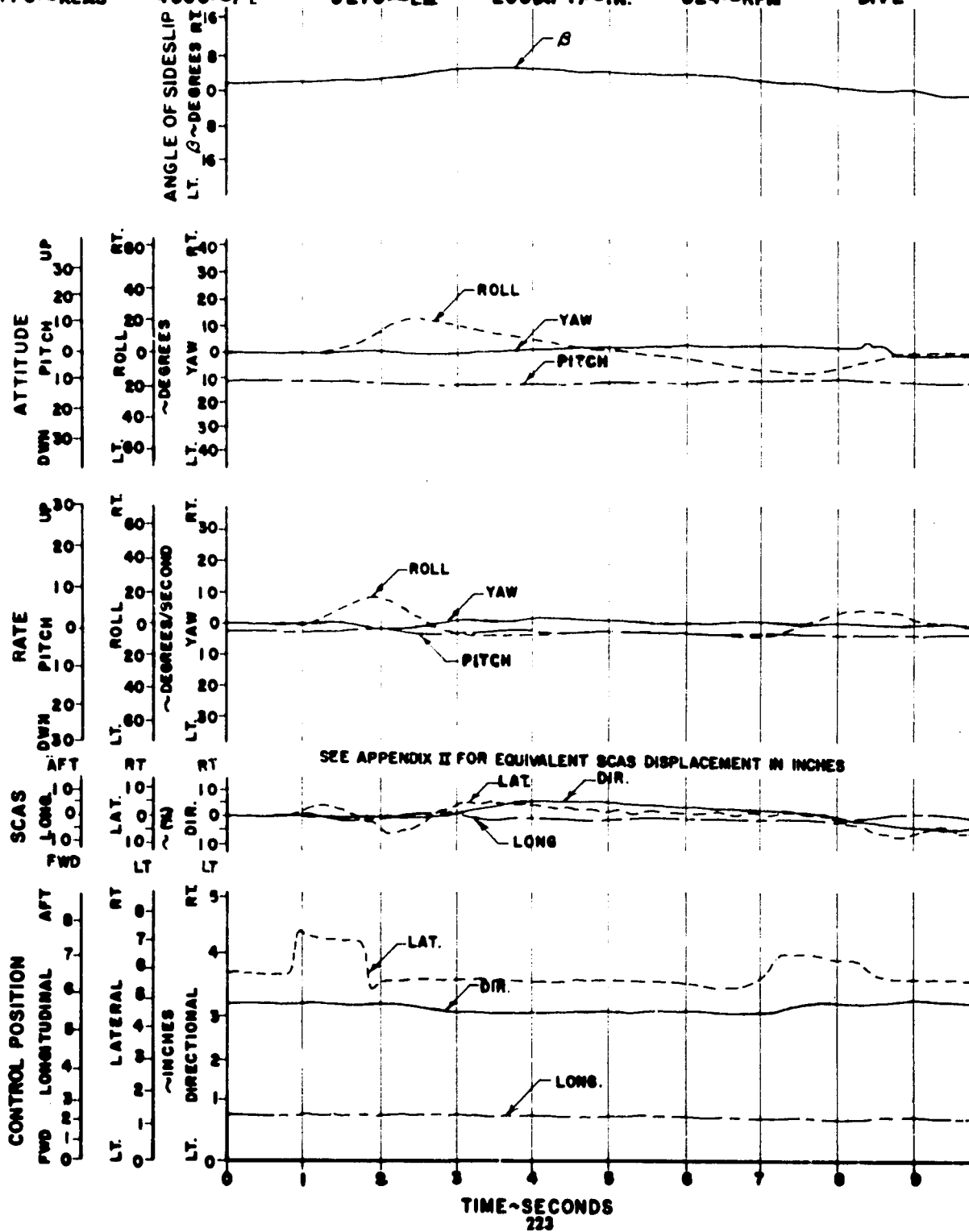


FIGURE NO.140 RIGHT LATERAL PULSE SCAS ON

AH-1G USA 76715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPED	ALTITUDE(Mb)	GROSS WEIGHT	LONG.C.G.	ROTOR SPEED	FLT. CONDITION
74~KCAS	3600~FT	8680~LB	195(MID.)~IN.	324~RPM	AUTOROTATION

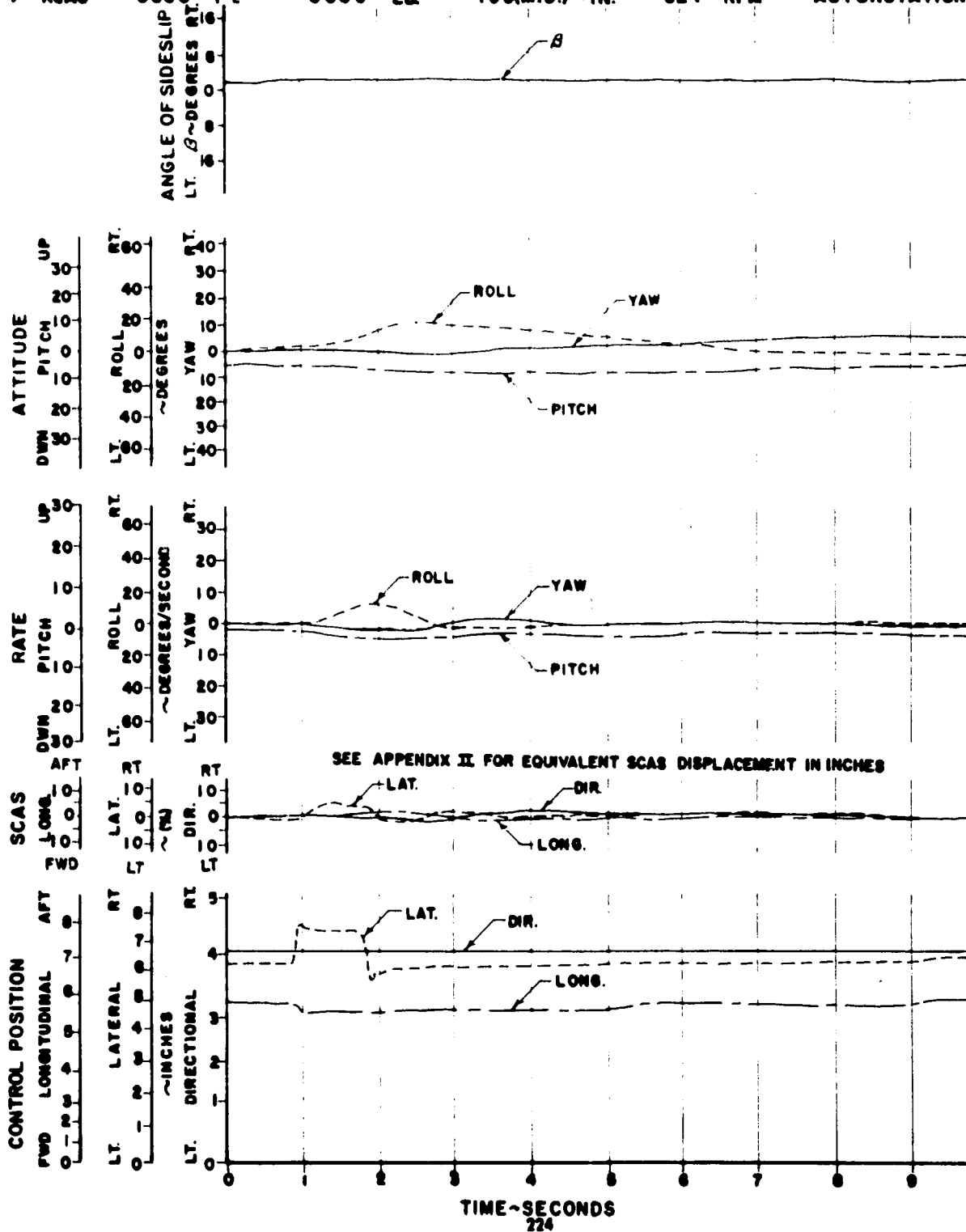


FIGURE NO. 141 RIGHT LATERAL PULSE SCAS OFF

AH-1G USA 76715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED
64~KCS

ALTITUDE(Hg)
3600~FT

GROSS WEIGHT
8680~LB

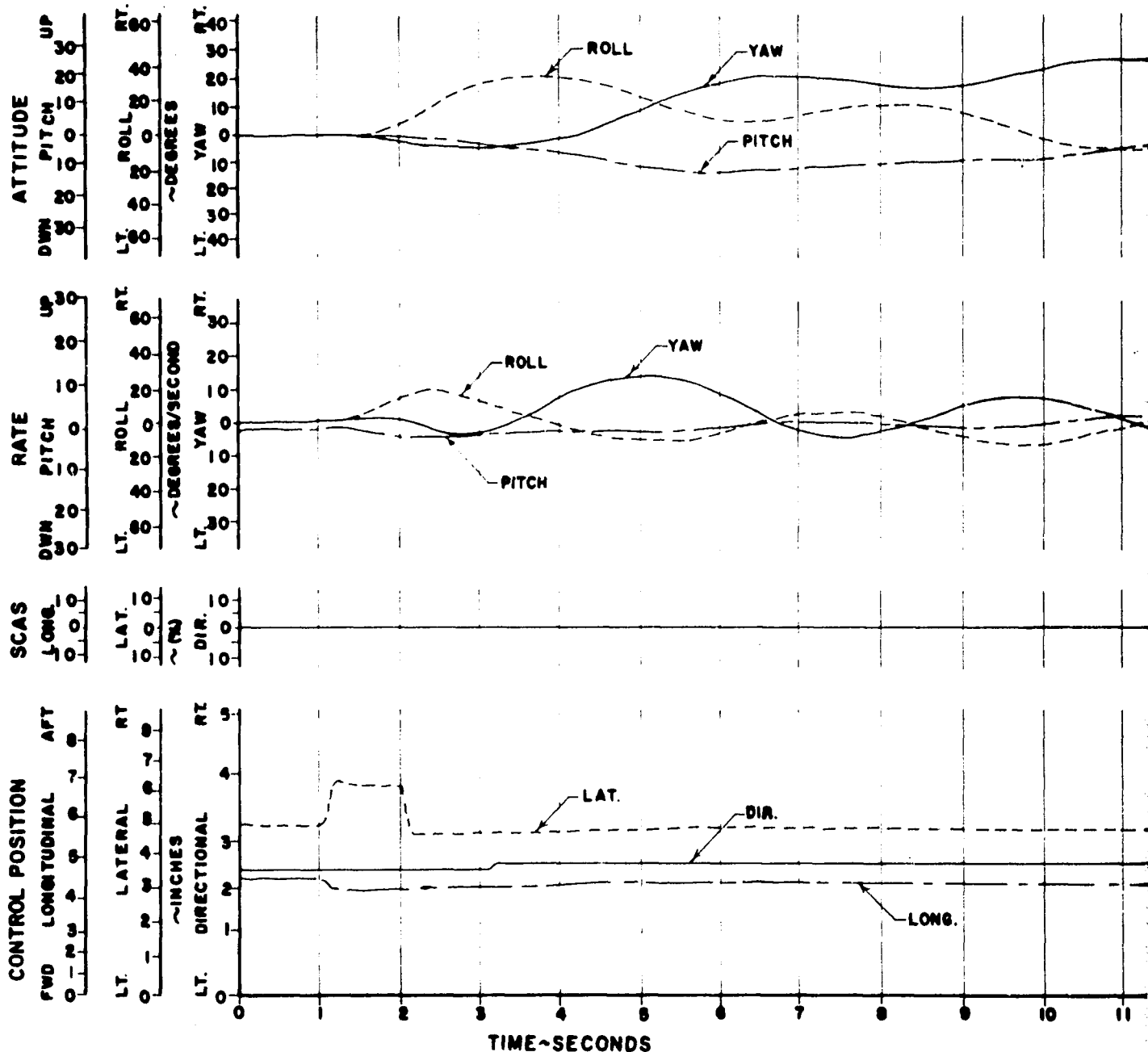
LONG. C.G.
195(MID.)~IN.

ROTOR SPEED
324~RPM

FLT. CONDITION
CLIMB

ANGLE OF SIDESLIP
LT. 3~DEGREES RT. 5

(INOPERATIVE)



0.141
SE SCAS OFF

3695
JET POD FAIRINGS REMOVED
S.C.G. ROTOR SPEED FLT. CONDITION
(D.)-IN. 324~RPM CLIMB

(OPERATIVE)

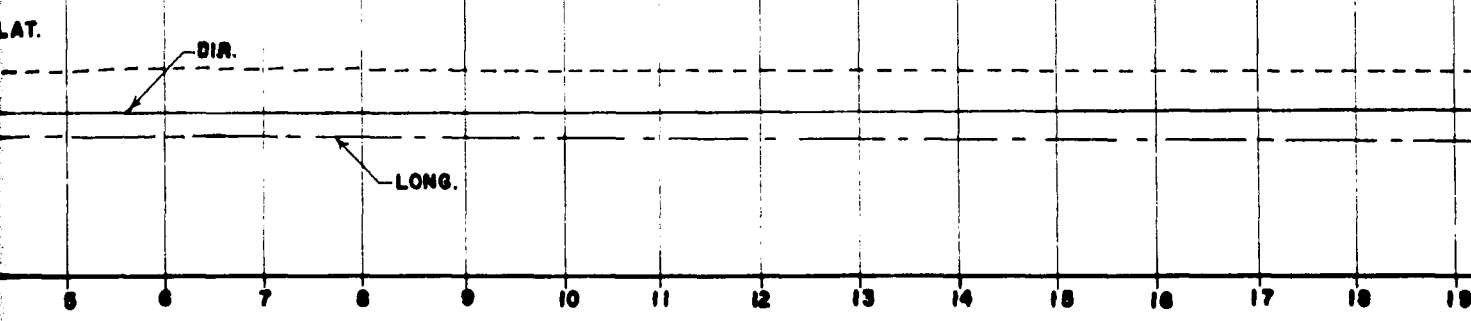
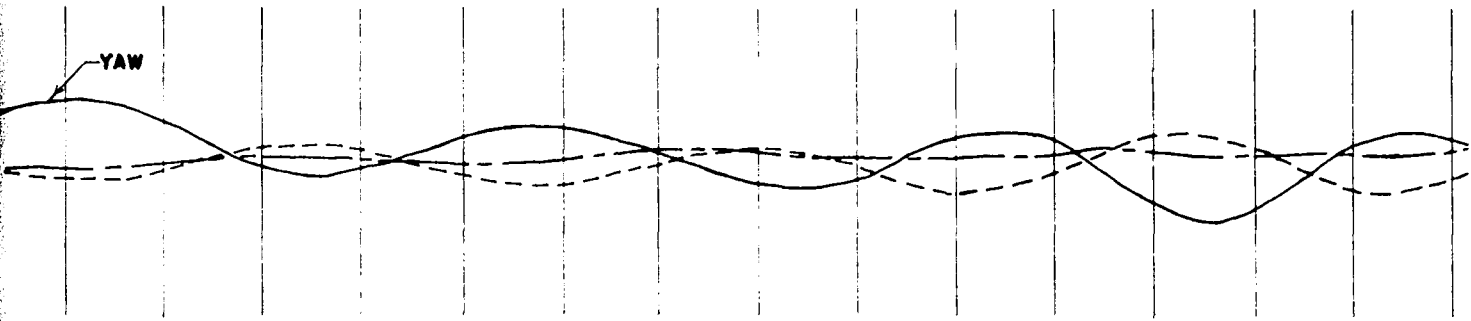
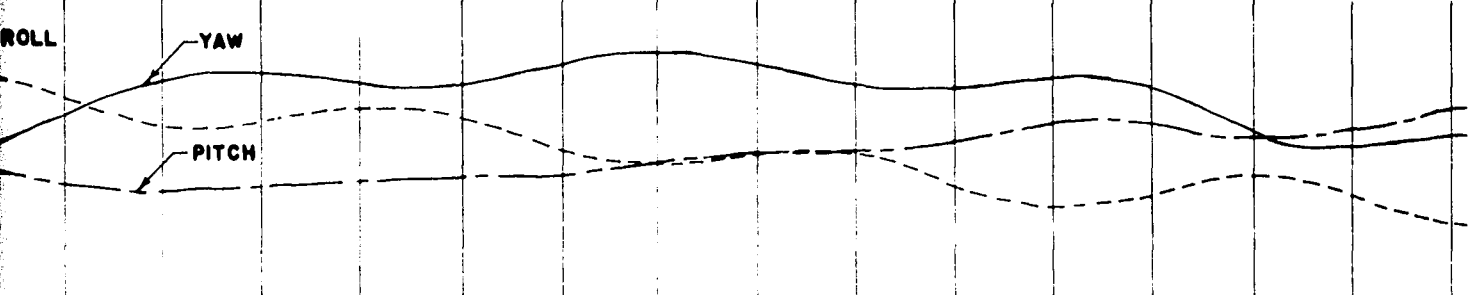


FIGURE NO. 142
DIRECTIONAL DYNAMIC STABILITY SUMMARY
AH-1G USA S/N 715695
LEFT & RIGHT CONTROL PULSES

CONFIG	AVG GW -LB	AVG ALT H _D -FT	AVG LONG CG -IN	SCAS	V _{MIN} POWER (LEVEL FLT)			.8 V _H (LEVEL FLT)			V _H (LEVEL FLT)		
					ζ	DESCRIP	AIRSPEED -CAS	ζ	DESCRIP	AIRSPEED -CAS	ζ	DESCRIP	AIRSPEED -CAS
CLEAN	7210	4200	201 (AFT)	ON	.13 1.0	HEAVILY DAMPED	65	NA NA	DEAD BEAT	107	.29 .6	HEAVILY DAMPED	138
				OFF	.22 .5	HEAVILY DAMPED		.27 .2	LIGHTLY DAMPED		.27 0	NEUTRAL DAMPED	
HEAVY HOG ☆	7490	5000	201 (AFT)	ON	.15 .6	HEAVILY DAMPED	60	.10 .9	HEAVILY DAMPED	105	NF NF	NF NF	NF
				OFF	.19 .2	LIGHTLY DAMPED		.24 .1	LIGHTLY DAMPED		NF NF	NF NF	
HEAVY HOG ☆☆	9180	4600	200 (AFT)	ON	NA NA	DEAD BEAT	60	.23 .7	HEAVILY DAMPED	104	.26 .5	HEAVILY DAMPED	136
				OFF	NF NF	NF NF		.22 .6	NF NF		.25 .1	LIGHTLY DAMPED	
HEAVY HOG ☆	7620	15400	201 (AFT)	ON	.11 .9	HEAVILY DAMPED	55	.12 1.1	HEAVILY DAMPED	88	.36 1.3	HEAVILY DAMPED	103
				OFF	NF NF	NF NF		NF NF	NF NF		.25 .1	LIGHTLY DAMPED	

CONFIG	AVG GW -LB	AVG ALT H _D -FT	AVG LONG CG-IN	SCAS	V _{LIMIT} (DIVE)			V _{MAX} (R/C)			V _{MIN} (R/D)		
					ζ	DESCRIP	AIRSPEED -CAS	ζ	DESCRIP	AIRSPEED -CAS	ζ	DESCRIP	AIRSPEED -CAS
CLEAN	7210	4200	201 (AFT)	ON	.21 .9	HEAVILY DAMPED	180	.31 .6	HEAVILY DAMPED	64	NA NA	DEAD BEAT	75
				OFF	.27 0	NEUTRAL DAMPED		.21 .3	UNDAMPED		.09 1.1	HEAVILY DAMPED	
HEAVY HOG ☆	7490	5000	201 (AFT)	ON	NA NA	DEAD BEAT	170	NA NA	DEAD BEAT	60	.18 .6	HEAVILY DAMPED	68
				OFF	.27 0	NEUTRAL DAMPED		.24 .1	LIGHTLY DAMPED		.12 .3	LIGHTLY DAMPED	
HEAVY HOG ☆☆	9180	4600	200 (AFT)	ON	.28 .5	HEAVILY DAMPED	170	NF NF	NF NF	NF	NF NF	NF NF	NF
				OFF	.21 0	NEUTRAL DAMPED		NF NF	NF NF		NF NF	NF NF	

NOTE: ALL APPLICABLE NOTES ARE PRESENTED ON FIGURE 150.

FIGURE NO. 143 RIGHT DIRECTIONAL PULSE SCAS ON

AH-1G USA 76715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 55~KCAS ALTITUDE(Hb) 15400~FT GROSS WEIGHT 7620~LB LONG.C.G. 201(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT.

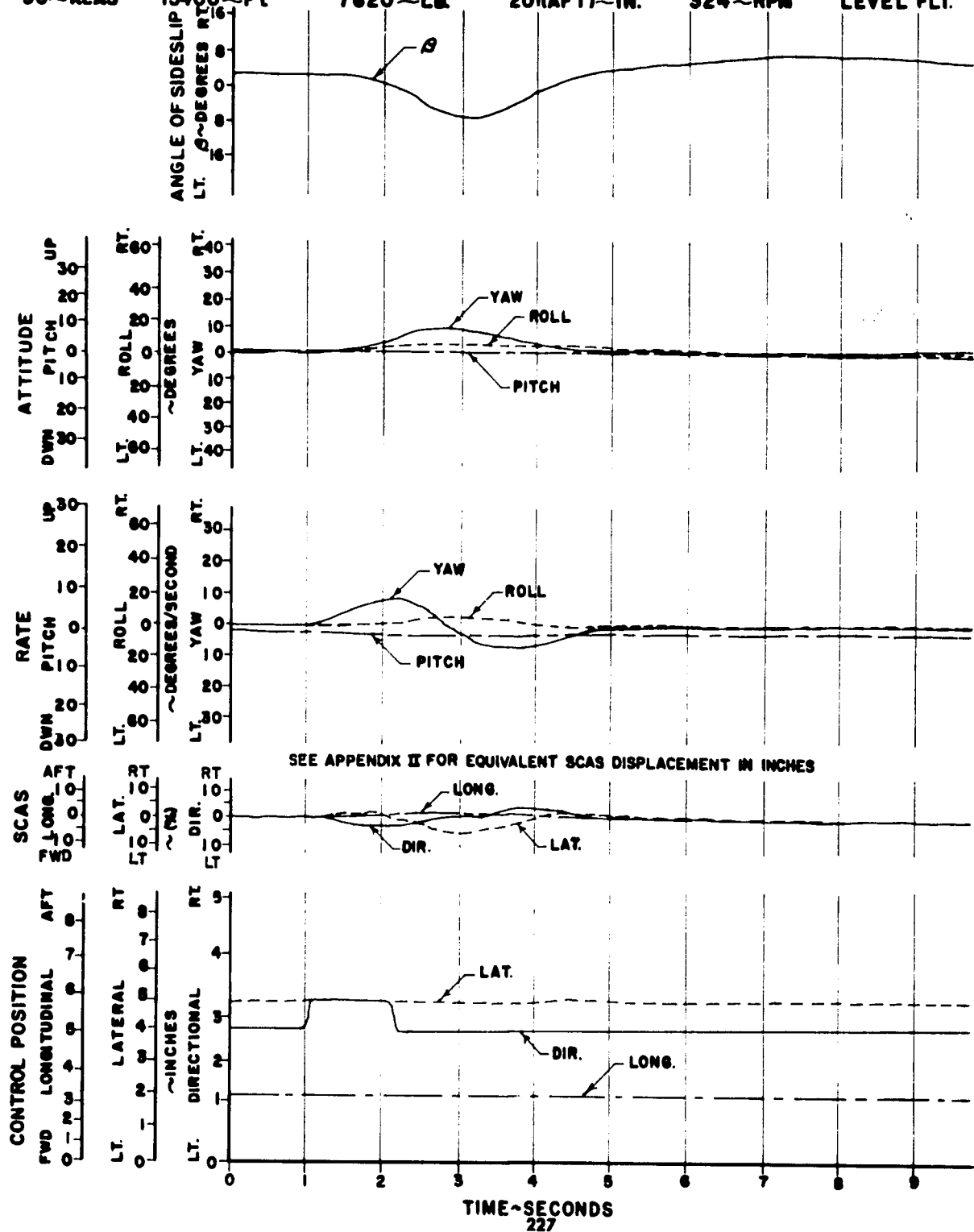


FIGURE NO.144 RIGHT DIRECTIONAL PULSE SCAS ON

AH-1G USA 76715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 104 ~ KCAS ALTITUDE(Ho) 4600 ~ FT GROSS WEIGHT 9180 ~ LB LONG. C.G. 201(AFT) ~ IN. ROTOR SPEED 324 ~ RPM FLT. CONDITION LEVEL FLT.

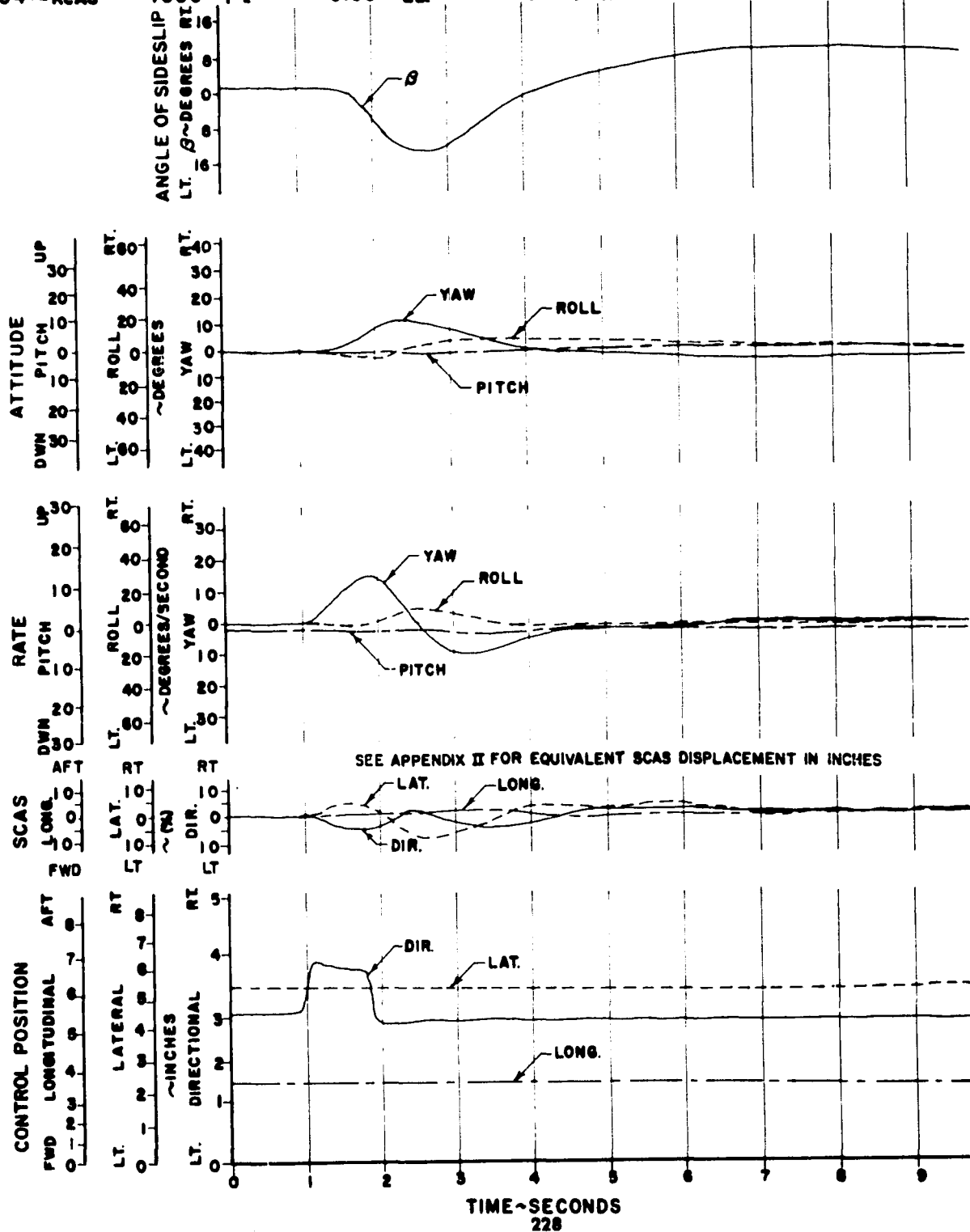


FIGURE NO. 145 LEFT DIRECTIONAL PULSE SCAS ON

AH-1G USA 6715695
HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPED 135~KCAS ALTITUDE(Mb) 4600~FT GROSS WEIGHT 9180~LB LONG.C.G. 201(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT.

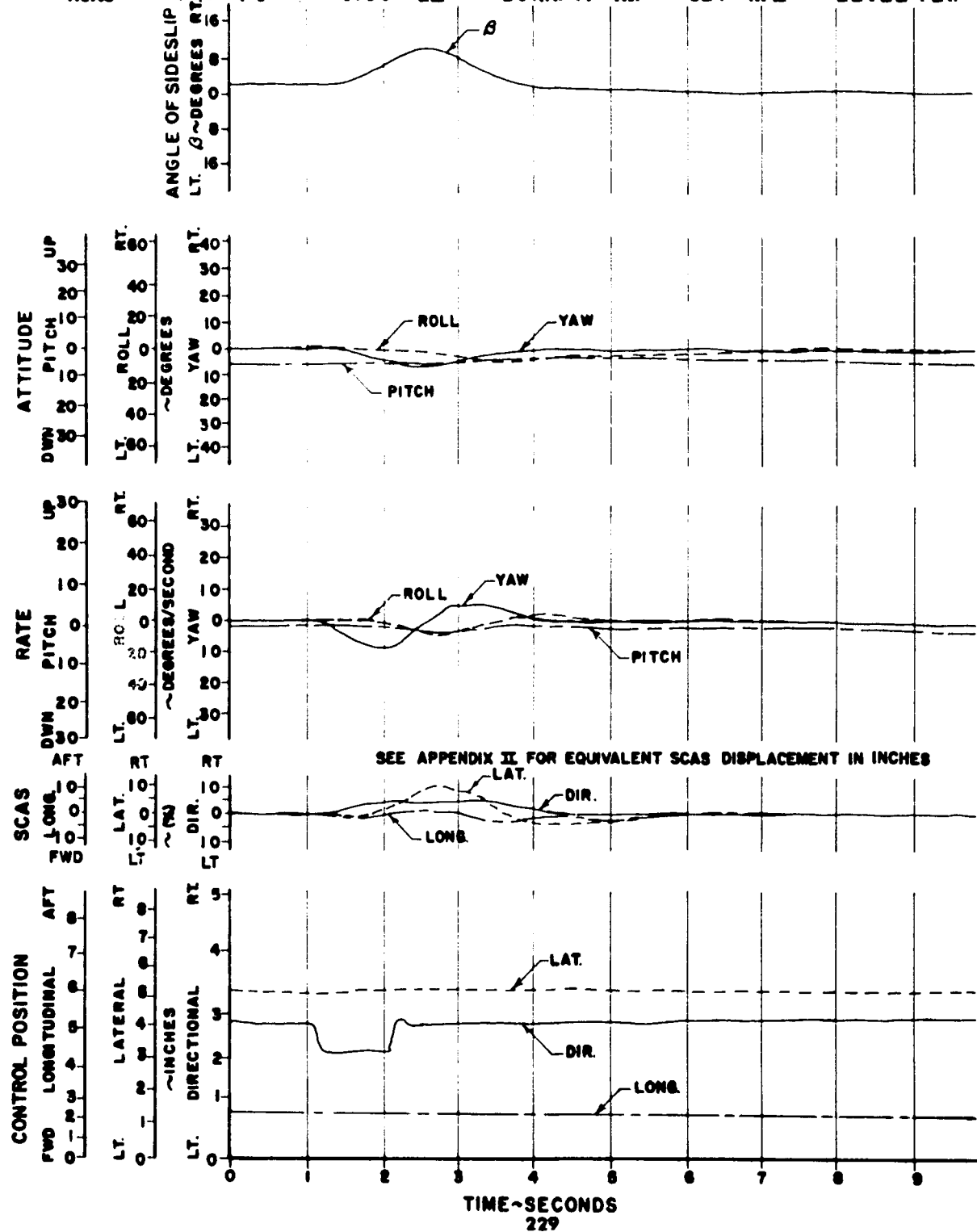


FIGURE NO. 146 LEFT DIRECTIONAL PULSE SCAS ON

AH-1G USA 76715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED
170~KCAS

ALTITUDE(Hd)
4600~FT

GROSS WEIGHT
9180~LB

LONG.C.G.
200(AFT)~IN.

ROTOR SPEED
324~RPM

FLT.CONDITION
DIVE

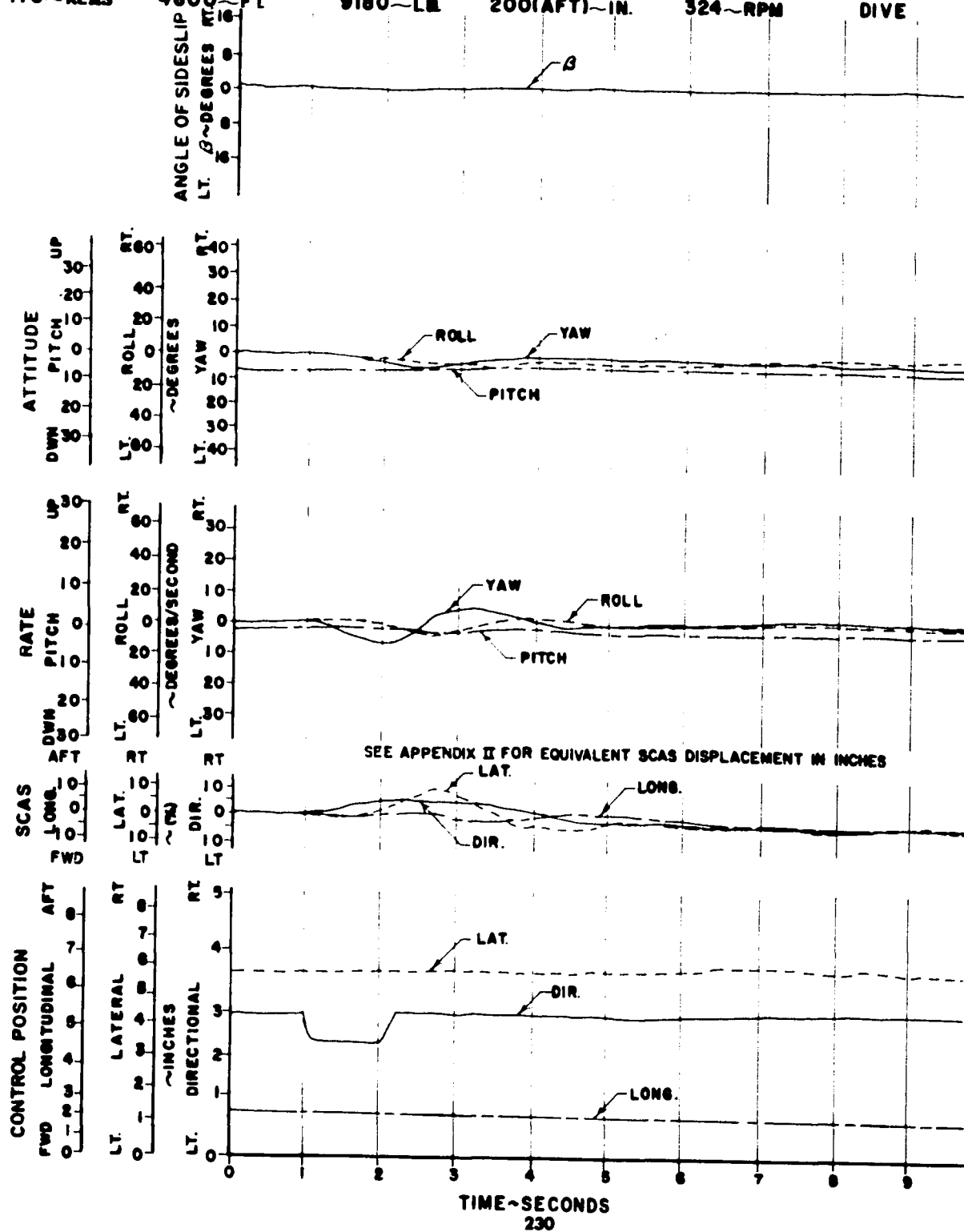


FIGURE NO. 147 LEFT DIRECTIONAL PULSE SCAS ON

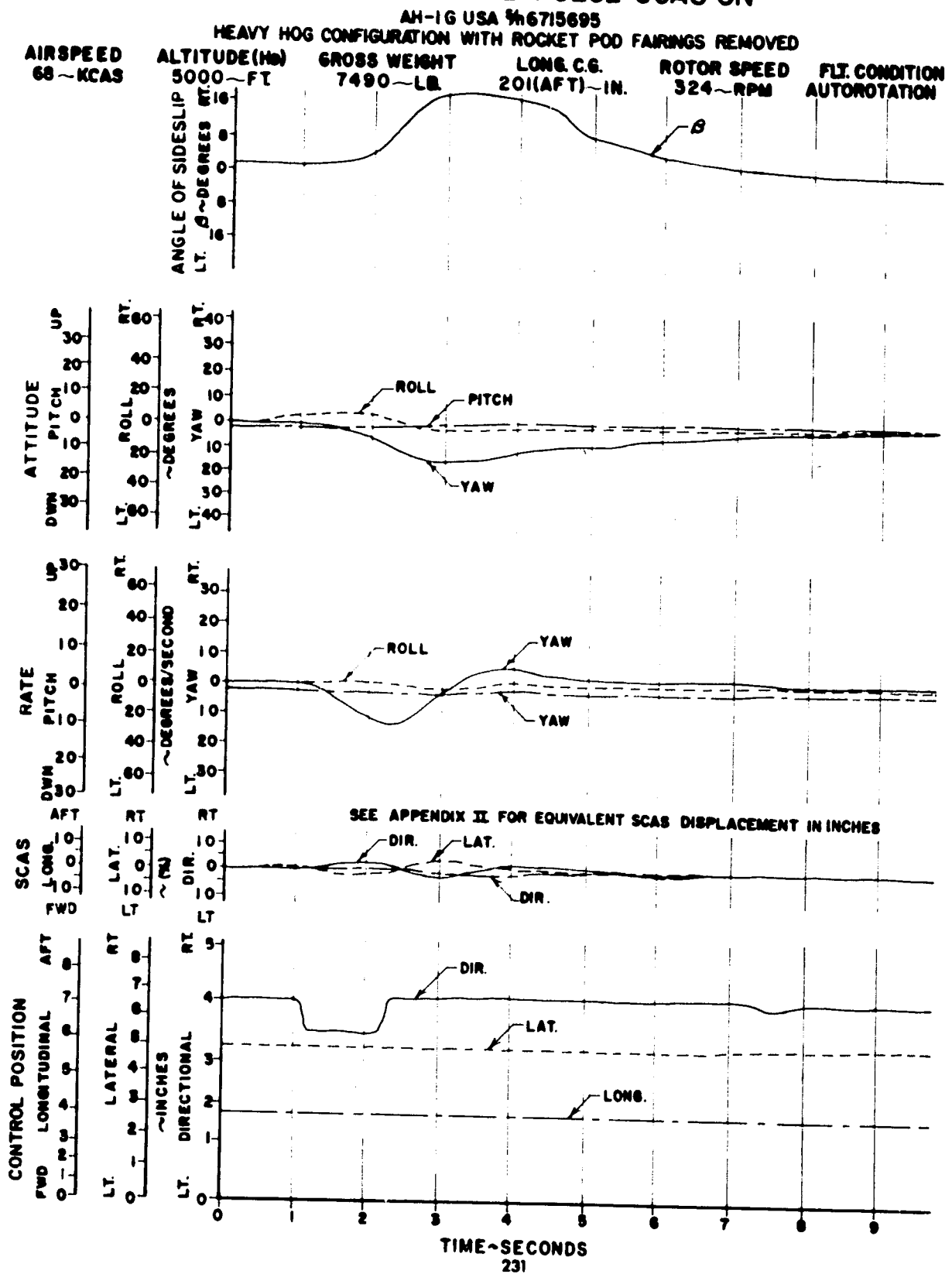


FIGURE NO. 148 RIGHT DIRECTIONAL PULSE SCAS ON

AH-1G USA 76715695
CLEAN CONFIGURATION

AIRSPED
64~KCAS

ALTITUDE(MN)
4200~FT

GROSS WEIGHT
7210~LB

LONG.C.G.
201(AFT)~IN.

ROTOR SPEED
324~RPM

FLT CONDITION
CLIMB

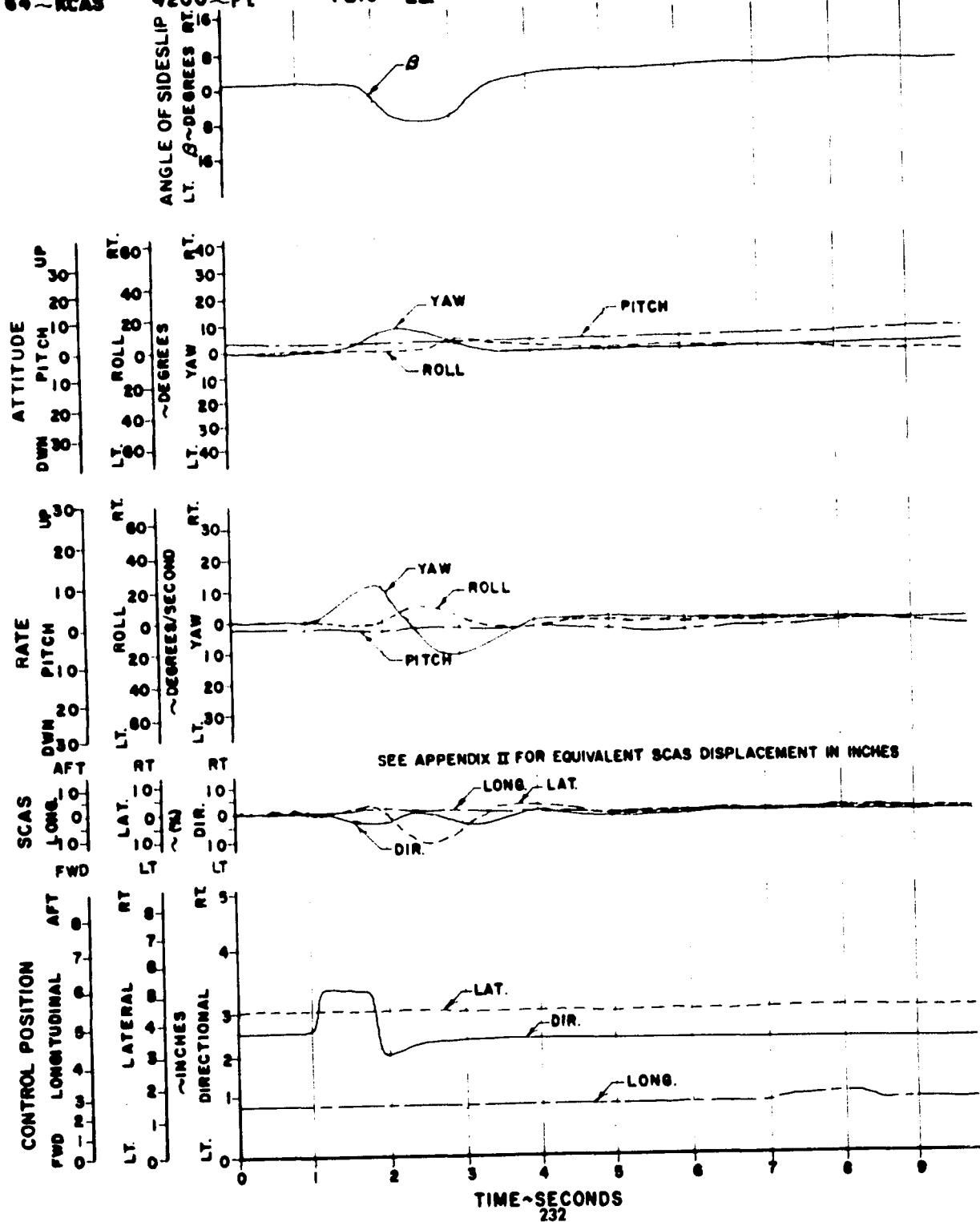
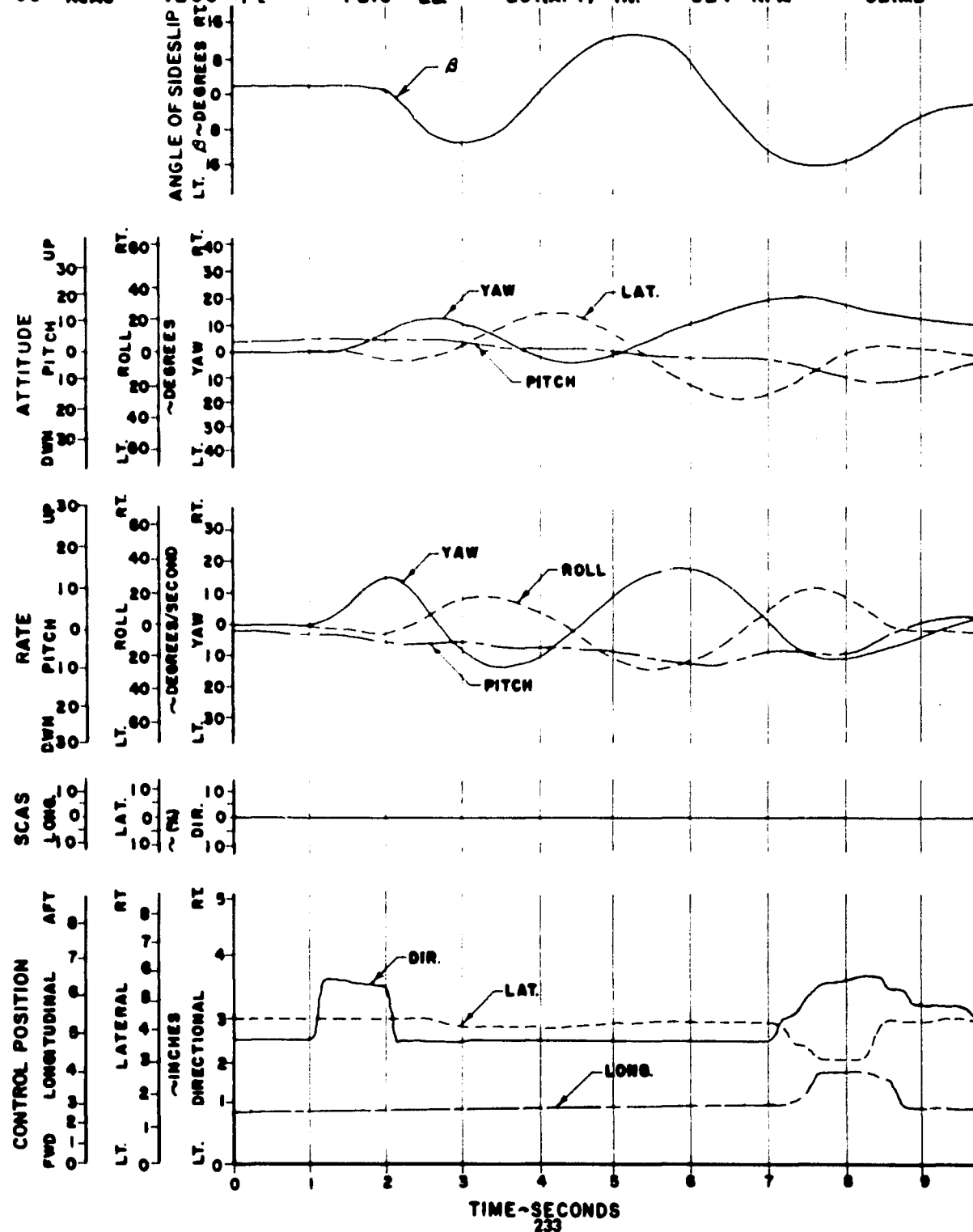


FIGURE NO. 149 RIGHT DIRECTIONAL PULSE SCAS OFF

AH-1G USA #6715695
CLEAN CONFIGURATION

AIRSPED 60~KCAS ALTITUDE(Hg) 4200~FT GROSS WEIGHT 7210~LB LONG.C.G. 201(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION CLIMB



TIME~SECONDS
233

FIGURE NO. 150
LATERAL DIRECTIONAL DYNAMIC STABILITY
SKID TUBE FAIRING COMPARISON
LEFT AND RIGHT CONTROL PULSES

CONFIG	AVG GW -LB	AVG ALT -FT	AVG LONG CG-IN	SCAS	LATERAL										AH-1G USA S/N
					ω_H (LEVEL FLT)			V_H (LEVEL FLT)			V_{LIMIT} (DIVE)				
					ζ	DESCRIP	AIRSPEED - CAS	ζ	DESCRIP	AIRSPEED - CAS	ζ	DESCRIP	AIRSPEED - CAS		
CLEAN SKID FAIR- INGS OFF	8630	3700	199.5 (AFT)	ON	.20 1.4	HEAVILY DAMPED	110	.31 1.6	HEAVILY DAMPED	143	NA NA	DEAD BEAT	165	615247	
				OFF	NF	NF		.29 1.1	UNDAMPED		.29 1.1	UNDAMPED			
CLEAN	7300	4100	201 (AFT)	ON	.57 1.5	HEAVILY DAMPED	106	NA NA	DEAD BEAT	142	.44 1.5	HEAVILY DAMPED	180	715695	
				OFF	.19 .6	HEAVILY DAMPED		.25 .1	LIGHTLY DAMPED		.29 .1	LIGHTLY DAMPED			

DIRECTIONAL														
CONFIG	AVG GW -LB	AVG ALT -FT	AVG LONG CG -IN	SCAS	ω_H (LEVEL FLT)			V_H (LEVEL FLT)			V_{LIMIT} (DIVE)			AH-1G USA S/N
					ζ	DESCRIP	AIRSPEED - CAS	ζ	DESCRIP	AIRSPEED - CAS	ζ	DESCRIP	AIRSPEED - CAS	
CLEAN SKID TUBE FAIR- INGS OFF	8630	3700	199.5 (AFT)	ON	NA NA	HEAVILY DAMPED	115	.29 1.5	HEAVILY DAMPED	143	.41 1.5	HEAVILY DAMPED	165	615247
				OFF	.25 1.1	UNDAMPED		.21 1.2	UNDAMPED		NF NF			
CLEAN	7210	4200	201 (AFT)	ON	NA NA	DEAD BEAT	107	.29 .6	HEAVILY DAMPED	136	.21 .9	HEAVILY DAMPED	180	715695
				OFF	.27 1.2	LIGHTLY DAMPED		.27 .6	NEUTRAL DAMPED		.27 0	NEUTRAL DAMPED		

- NOTES:
1. \square DENOTES WITHOUT ROCKETS
 2. \square DENOTES WITH ROCKETS.
 3. ω IS THE DAMPED NATURAL FREQUENCY IN CYCLES PER SECOND.
 4. ζ DAMPING RATIO.
 5. DESCRIPTION DENOTES DEGREE OF DAMPING BASED ON THE FOLLOWING DEFINITIONS.
 - a. DEAD BEAT ($\zeta > 1.8$)
 - b. HEAVILY DAMPED ($\zeta = .5$ to 1.8)
 - c. LIGHTLY DAMPED ($\zeta = .1$ to $.4$)
 - d. NEUTRALLY DAMPED ($\zeta = 0$)
 - e. UNDAMPED ($\zeta < 0$)
 6. "N A" DENOTES THAT ω and ζ ARE NOT AVAILABLE.
 7. "NF" DENOTES THAT THE CONDITION WAS NOT FLOWN.
 8. ALL ABOVE NOTES ARE APPLICABLE FOR FIGURE 126, 134, AND 142.

FIGURE NO. 151
SUMMARY LATERAL-DIRECTIONAL DYNAMIC STABILITY
 AH-1G USAF 715695
 SCAS ON

NOTES: 1. ALL CONDITIONS TESTED ON W/N 715695
 FALL WITHIN SOLID LINE
 2. □ DENOTES CONDITIONS TESTED ON
 W/N 615247 WITH SKID TUBE FAIRINGS
 REMOVED

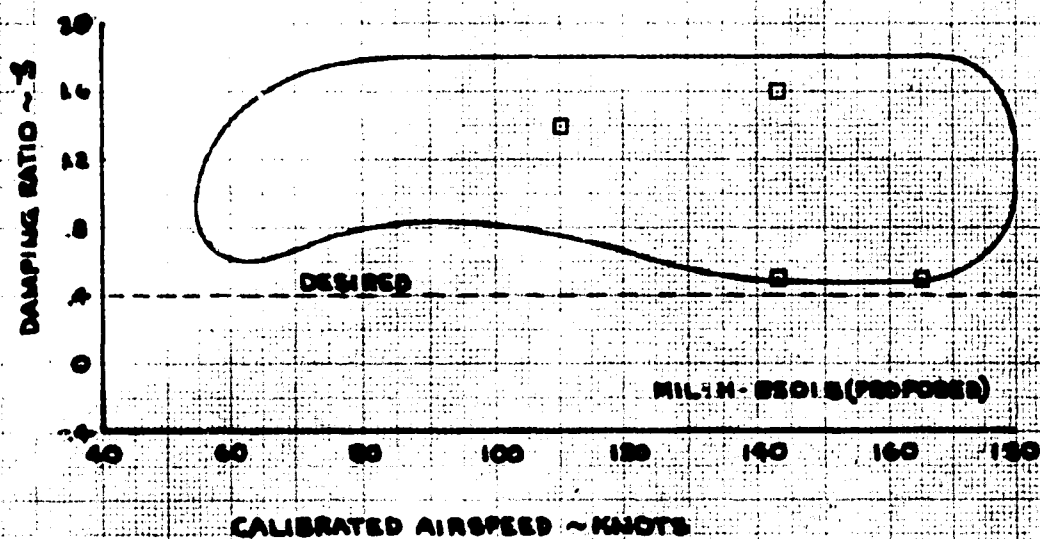
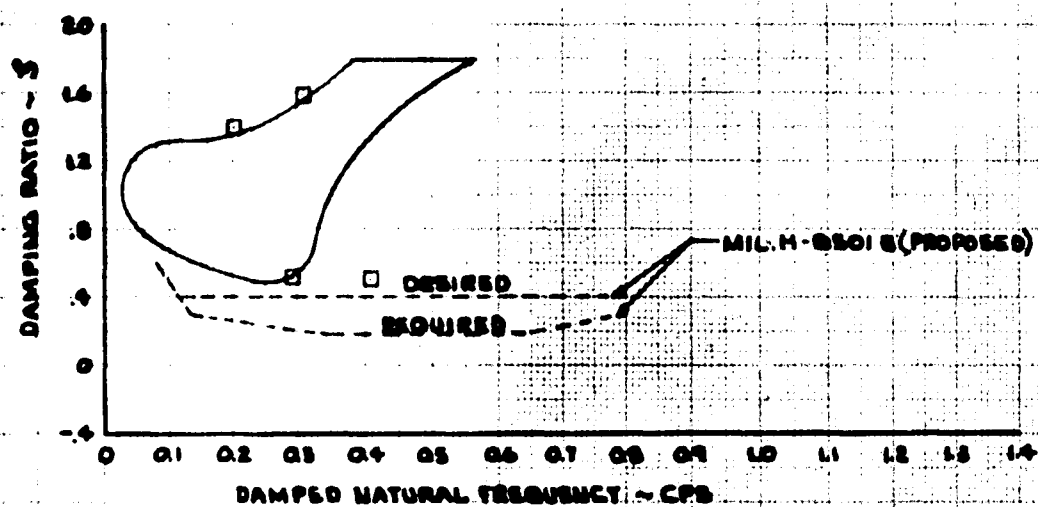


FIGURE NO. 152
SUMMARY LATERAL-DIRECTIONAL DYNAMIC STABILITY
AH-1G USAF 715695
SCAB OFF

NOTES: 1. ALL CONDITIONS TESTED ON S/N 715695.
 FALL WITHIN SOLID LINE
 2. □ DENOTES CONDITIONS TESTED ON
 S/N 615247 WITH SKID TUBE FAIRINGS
 REMOVED

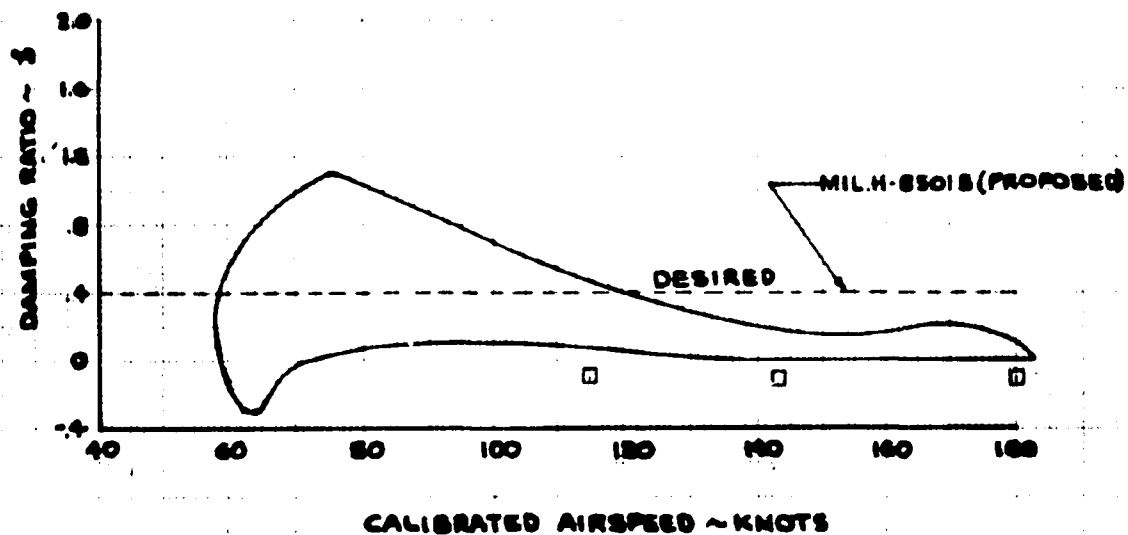
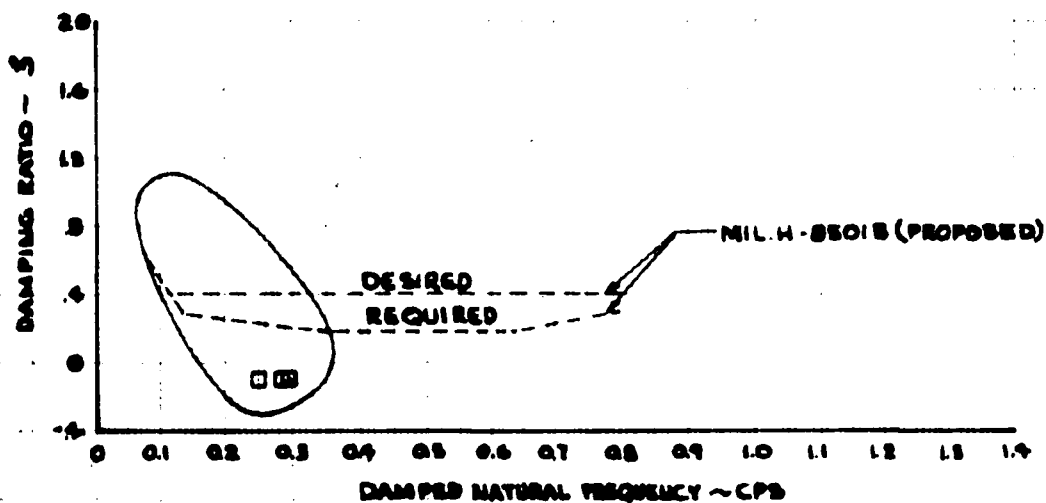
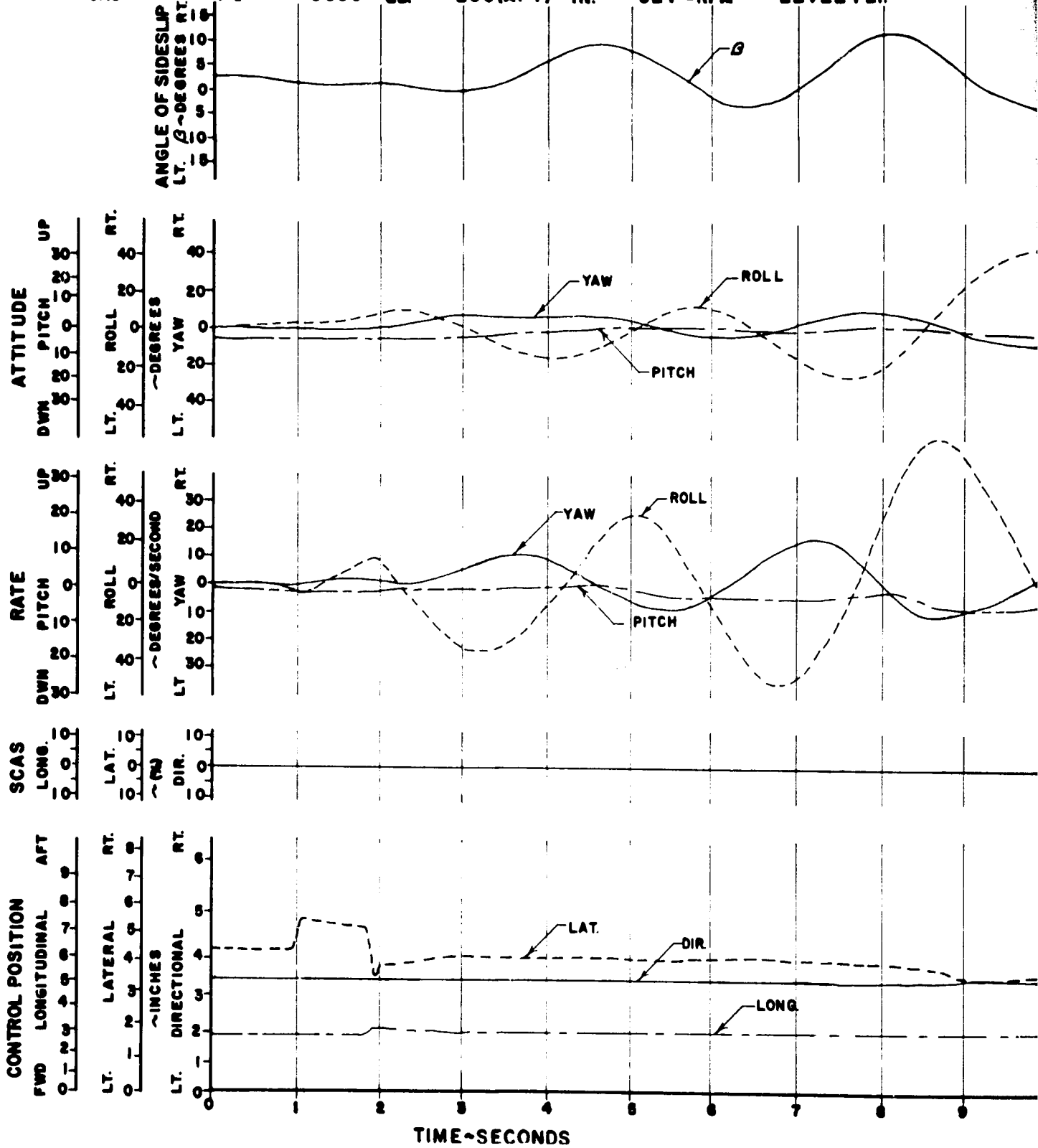


FIGURE NO. 153 RIGHT LATERAL PULSE SCAS OFF

AH-1G USA 76615247

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

AIRSPED	ALTITUDE(H)	GROSS WEIGHT	LONG. C.G.	ROTOR SPEED	FLT. CONDITION
142~KCAS	4000~FT	8660~LB.	200(AFT)~IN.	324~RPM	LEVEL FLT.



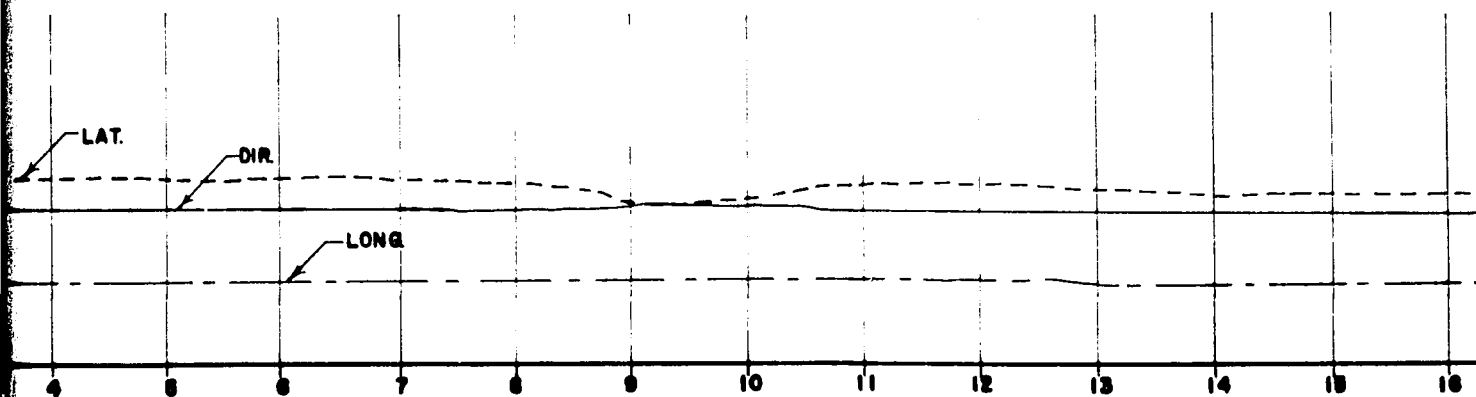
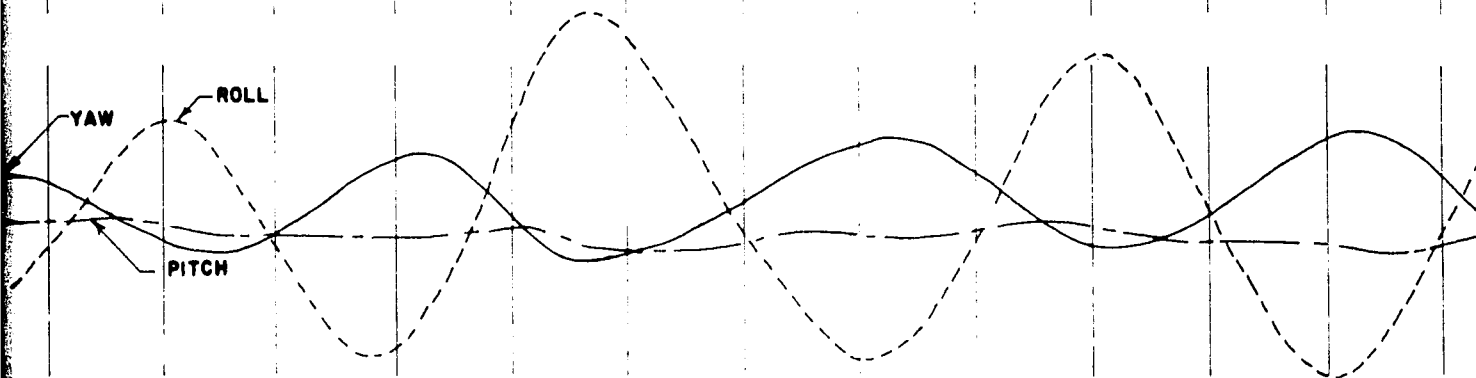
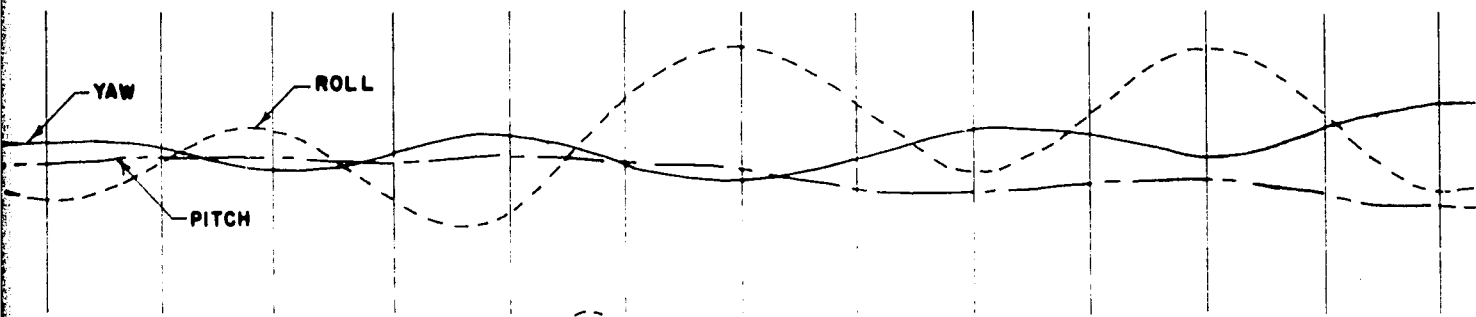
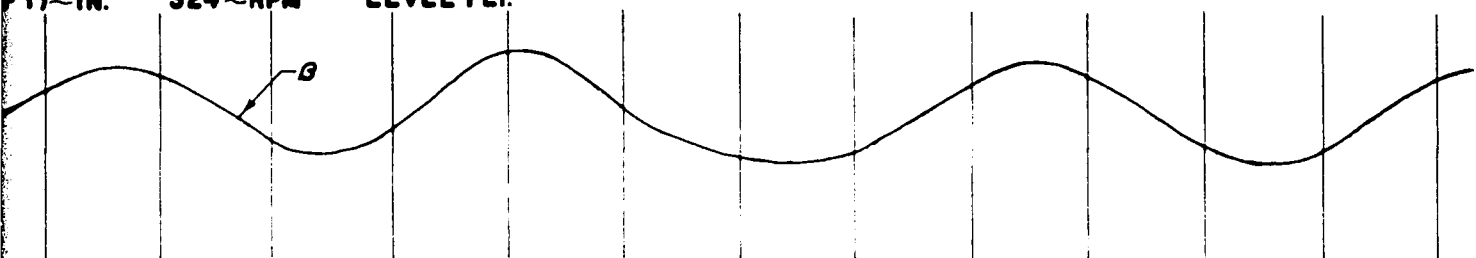
O. 153

ULSE SCAS OFF

15247

AR CROSS TUBE FAIRINGS REMOVED

L.C.G. ROTOR SPEED FLT. CONDITION
FT)~IN. 324~RPM LEVEL FLT.



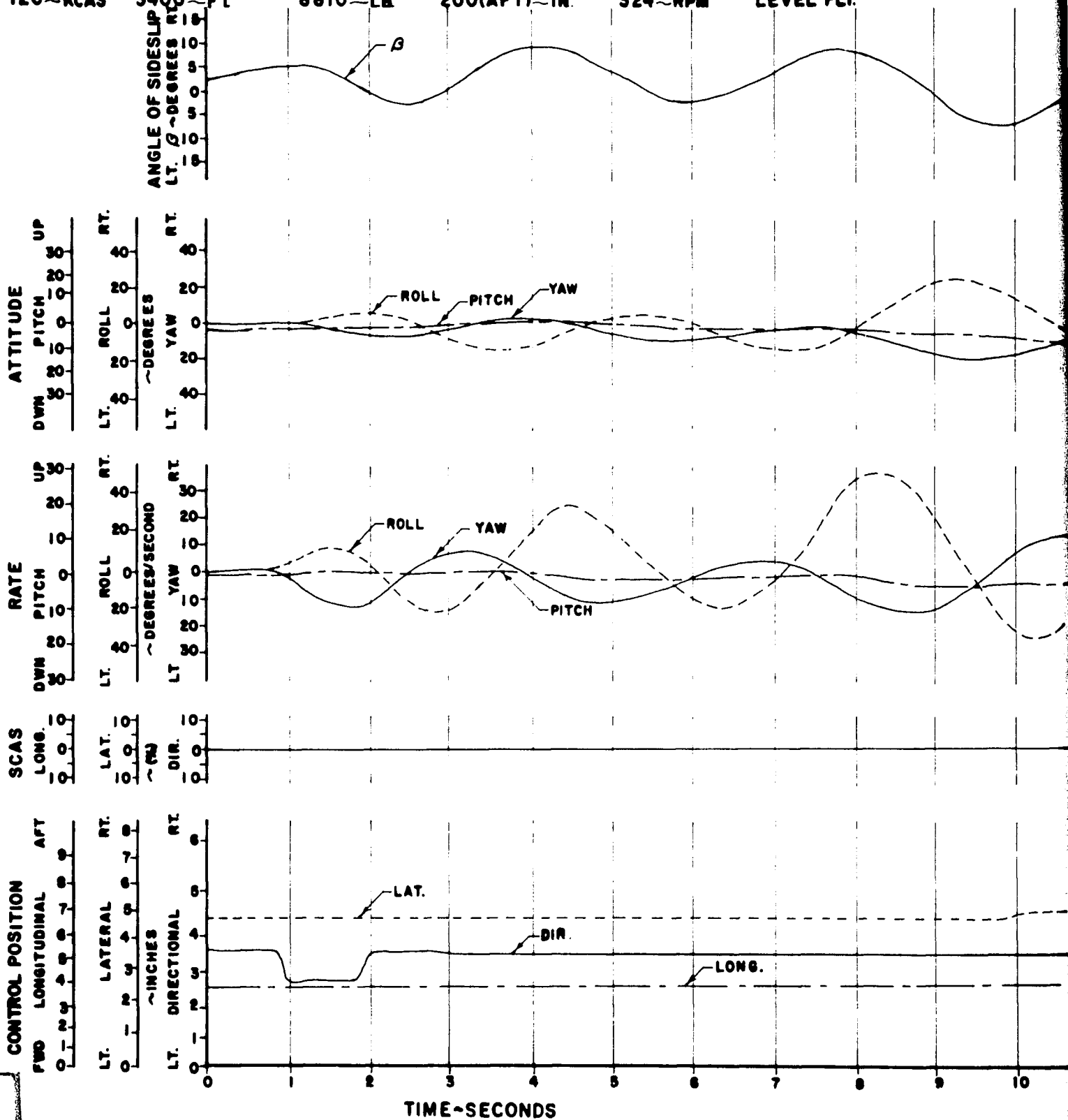
ONDS

FIGURE NO. 154 LEFT DIRECTIONAL PULSE SCAS OFF

AH-1G USA 96615247

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

AIRSPPEED 120~KCAS ALTITUDE(No) 3400~FT GROSS WEIGHT 8810~LB LONG.C.G. 200(AFT)~IN. ROTOR SPEED 324~RPM FLT. CONDITION LEVEL FLT.



SCAS OFF

TUBE FAIRINGS REMOVED

ROTOR SPEED
324~RPM

FLT. CONDITION
LEVEL FLT.

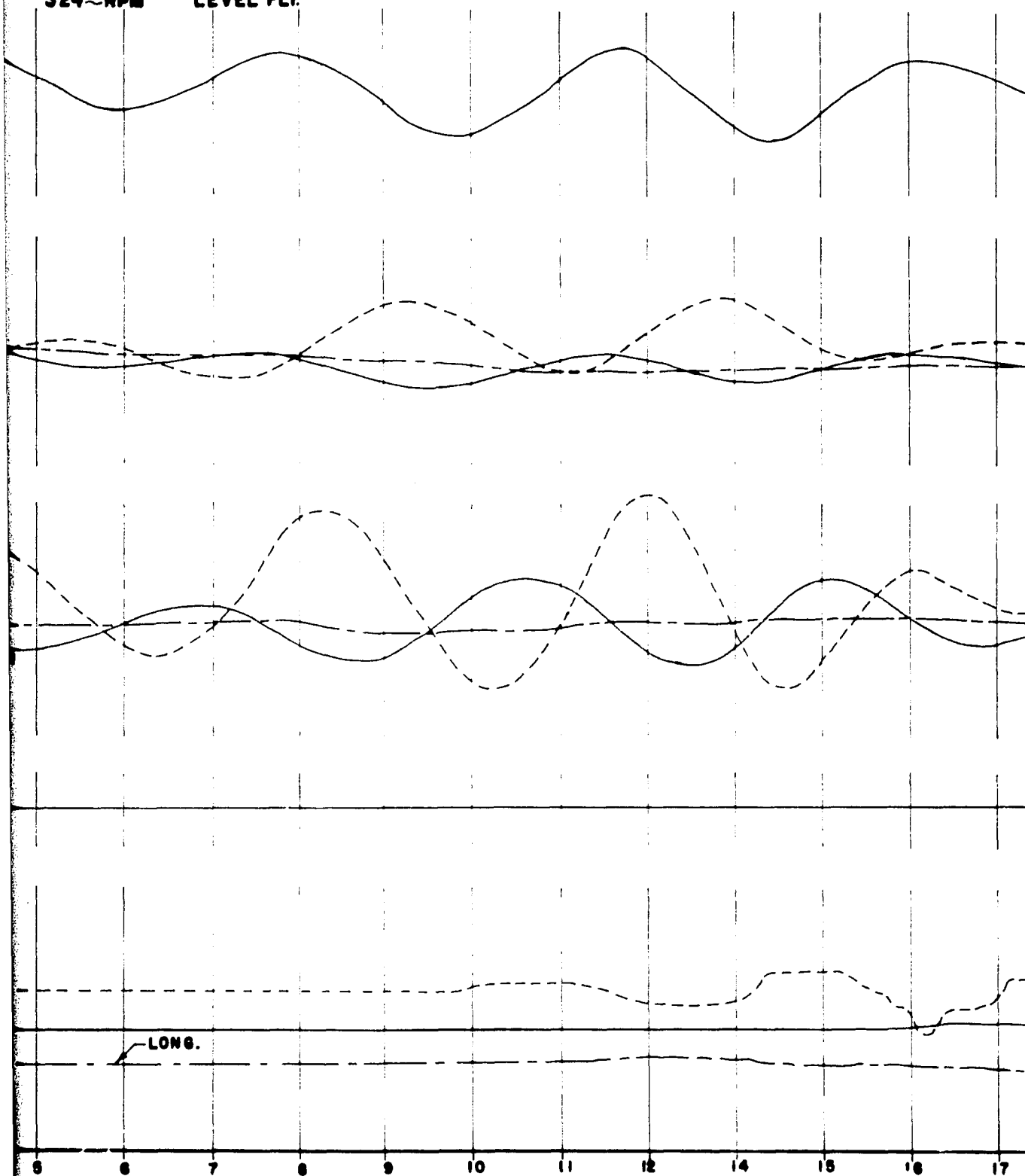


FIGURE No. 155
LONGITUDINAL RESPONSE CHARACTERISTICS
AH-1G USAF T156RS

SYM	AIR SPEED ~ CAS	AVG. ALT H ₀ ~ FT	AVG. GENT ~ LB	ANGLE C.S. ~ IN	ROTOR RPM	FLY COND	CONFIG	THRUST COEFF ~ C _T
□	111	3500	7800	201.0(AFT)	3240	LEV. FLT.	CLEAN	0.004070
○	116	4600	7760	201.0(AFT)	3240	LEV. FLT.	CLEAN	0.004410
◇	110	5000	7480	200.8(AFT)	3240	LEV. FLT.	HOG	0.004810
◻	152	4000	7800	200.4(AFT)	3240	LEV. FLT.	HOG	0.004861
▽	172	3500	8040	200.9(AFT)	3240	DIVE	HOG	0.004428
○	108	4000	9350	200.1(AFT)	3240	LEV. FLT.	HOG	0.005228
△	133	5050	9180	200.2(AFT)	3240	LEV. FLT.	HOG	0.005880
☆	108	4000	7670	191.8(FWD)	3240	LEV. FLT.	CLEAN	0.004899
◇	139	3500	7470	191.0(FWD)	3240	LEV. FLT.	CLEAN	0.004104
△	172	4000	7480	191.0(FWD)	3240	DIVE	CLEAN	0.004154

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF

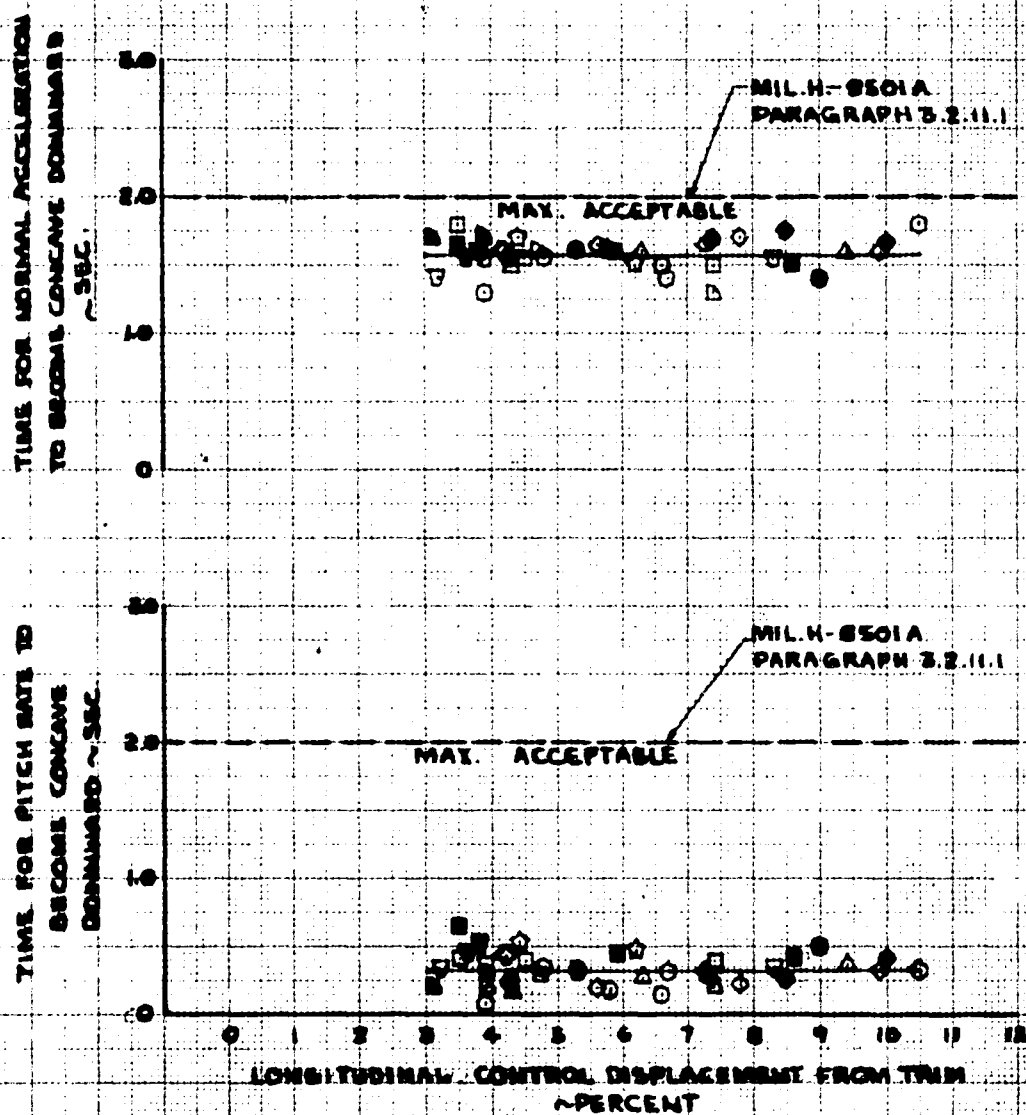


FIGURE No. 156
LONGITUDINAL CONTROLLABILITY SUMMARY
 AH-1G USA 6715693
 GROSS WEIGHT COMPARISON

SYM	AVG. ALTITUDE M ₀ ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LING. C.G. ~ IN.	ROTOR CONING RPM	THRUST COEFF. ~ C _T	PODS LOADING
○	3060	7910	199.6 (NFT)	3240 HVT. HOG	0.00466	PODS EMPTY
□	3470	9490	200.0 (NFT)	3240 HVT. HOG	0.00550	PODS LOADED (1634 LB. TOTAL)

- NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
 2. SOLID SYMBOLS DENOTE AFT INPUT
 3. FLAT SYMBOLS DENOTE LEVEL FLIGHT
 4. FLAGGED SYMBOLS DENOTE CLIMB
 5. TAILED SYMBOLS DENOTE AUTOROTATION
 6. SYMBOLS WITH CROSS DENOTE DIVE
 7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
 8. POINTS DERIVED FROM FIGURES 180 THROUGH 187, APPENDIX VII

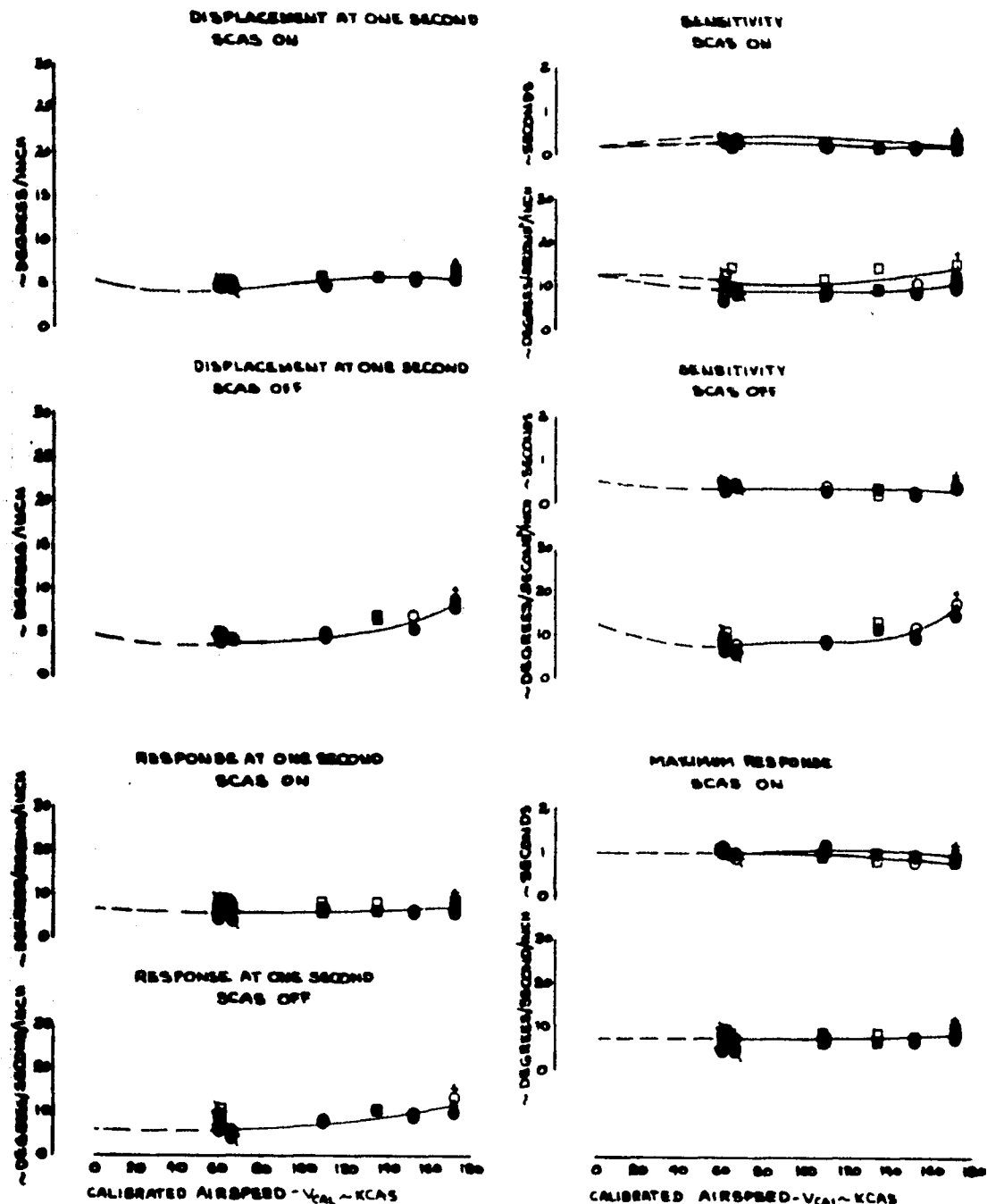


FIGURE No 157
LONGITUDINAL CONTROLLABILITY SUMMARY
 AH-1G USA 8716495
 CONFIGURATION COMPARISON

SYM	AVG. ALTITUDE H ₀ ~ FT	AVG. GROSS WEIGHT ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST ~ CT	COEFF. ~ C _T	PODS LOADING
0	5060	7910	199.6 (AF)	8240	HVY. NOG	0.004566		PODS EMPTY
0	5440	7780	201.2 (AF)	8240	CLEAN	0.004548		NO PODS

- NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
 2. SOLID SYMBOLS DENOTE AFT INPUT
 3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
 4. FLAGGED SYMBOLS DENOTE CLIMB
 5. TAILED SYMBOLS DENOTES AUTOROTATION
 6. SYMBOLS WITH CROSS DENOTE DIVE
 7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 800 → 830 RPM
 8. POINTS DERIVED FROM FIGURES 172 THROUGH 175, AND 180 THROUGH 185, APPENDIX VII

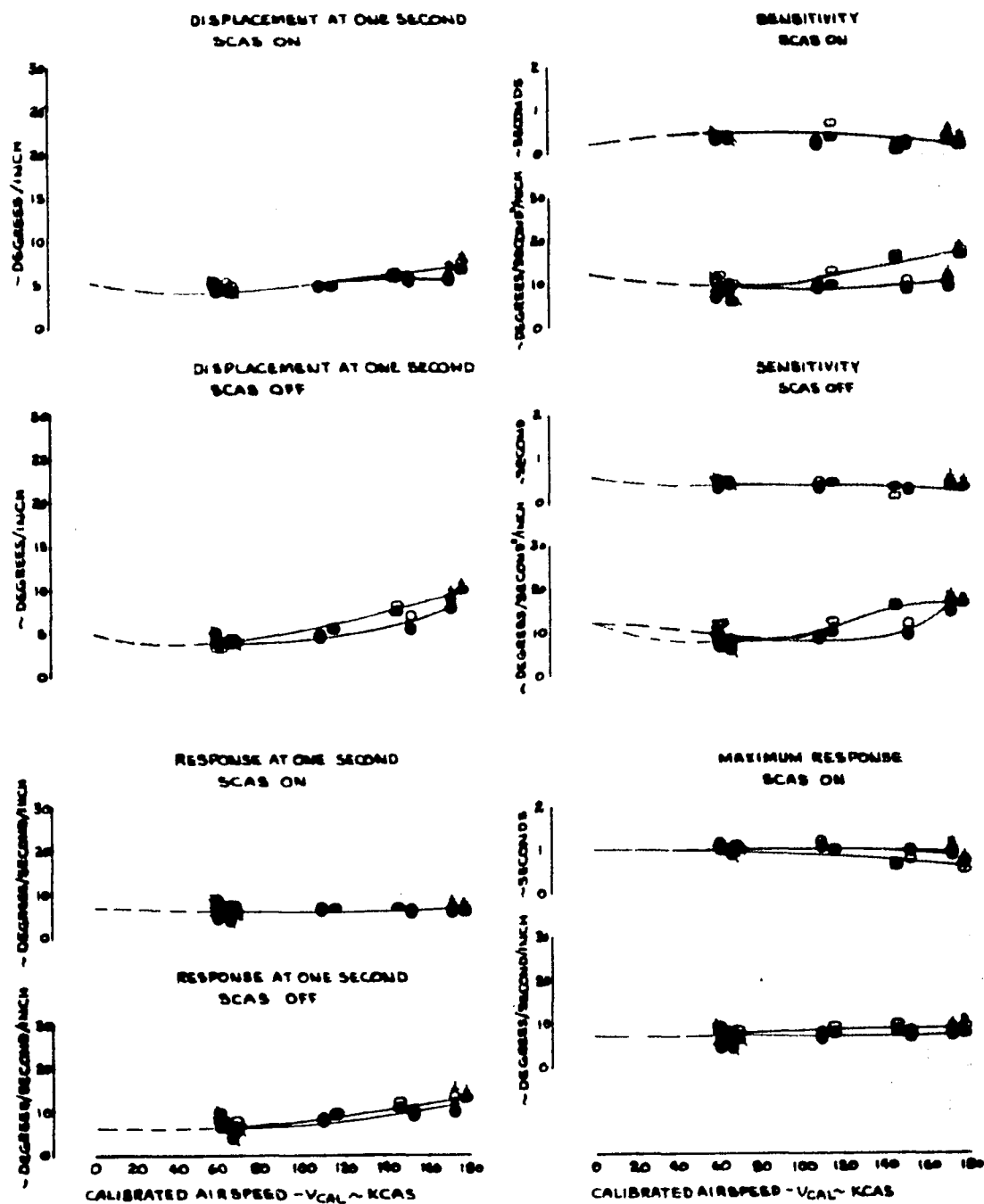


FIGURE NO. 158
LONGITUDINAL CONTROLLABILITY SUMMARY
AH-1G USA 6715648
CENTER OF GRAVITY COMPARISON

SYM	AVG ALTITUDE H ₀ ~ FT.	AVG GROSS WEIGHT ~ LB.	AVG LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C _T	PODS LOADING
○	6200	7610	190.8 (FWO)	3240	CLEAN	0.004548	NO PODS
●	5440	7780	201.2 (AFT)	3240	CLEAN	0.004543	NO PODS

NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
8. POINTS DERIVED FROM FIGURES 169 THROUGH 175, APPENDIX VII

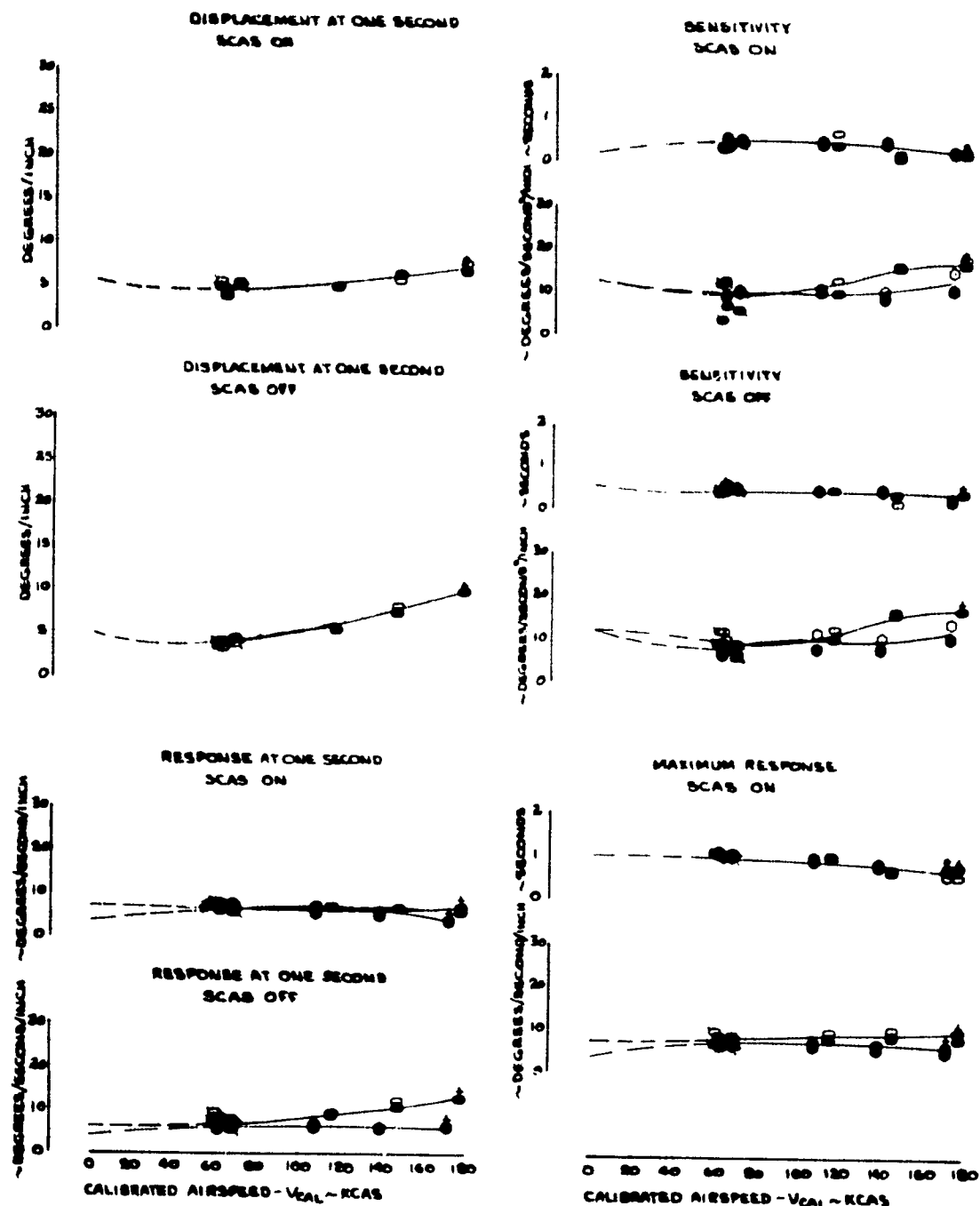


FIGURE No. 159
LONGITUDINAL CONTROLABILITY SUMMARY
 AH-1G USA 96718695
 ALTITUDE COMPARISON

SYM	AVG. ALTITUDE ~ FT	AVG. GROSS WEIGHT ~ LBS	AVG. LONG. CG ~ IN.	ROTOR CONFIG. RPM	THRUST COEFF. ~ C _T	PODS LOADING
O	5060	7910	199.6(AFT)	3240	HYV. HDG	0.004556 PODS EMPTY
Δ	15530	7840	200.9(AFT)	3240	HYV. HDG	0.006896 PODS EMPTY

NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
 2. SOLID SYMBOLS DENOTE AFT INPUT
 3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
 4. FLAGGED SYMBOLS DENOTE CLIMB
 5. TAILED SYMBOLS DENOTE AUTOROTATION
 6. SYMBOLS WITH CROSSES DENOTE DIVE
 7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
 8. POINTS DERIVED FROM FIGURES 180 THROUGH 185, AND 188 THROUGH 191, APPENDIX VII

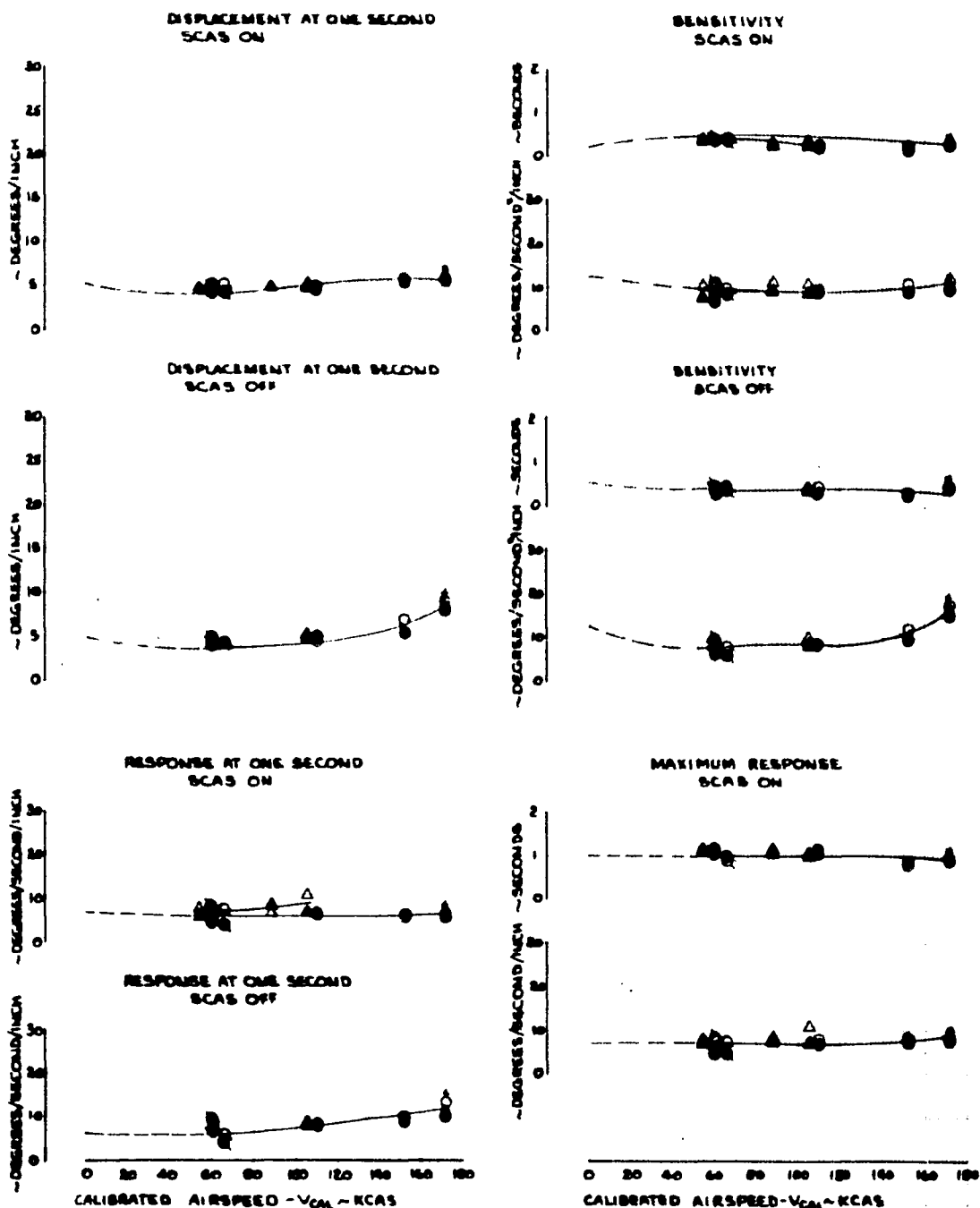


FIGURE No. 160
LATERAL CONTROLLABILITY SUMMARY
AH-1G USA 6715695
GROSS WEIGHT COMPARISON

SYM.	AVG. ALTITUDE H ₀ ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C _T	PODS LOADED
○	5290	7800	200.2 (AFT)	324.0	HVY HOG	0.004529	PODS EMPTY
□	5270	9390	200.2 (AFT)	324.0	HVY HOG	0.005453	PODS LOADED

- NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300-360 RPM
8. POINTS DERIVED FROM FIGURES 212 THROUGH 218, APPENDIX III

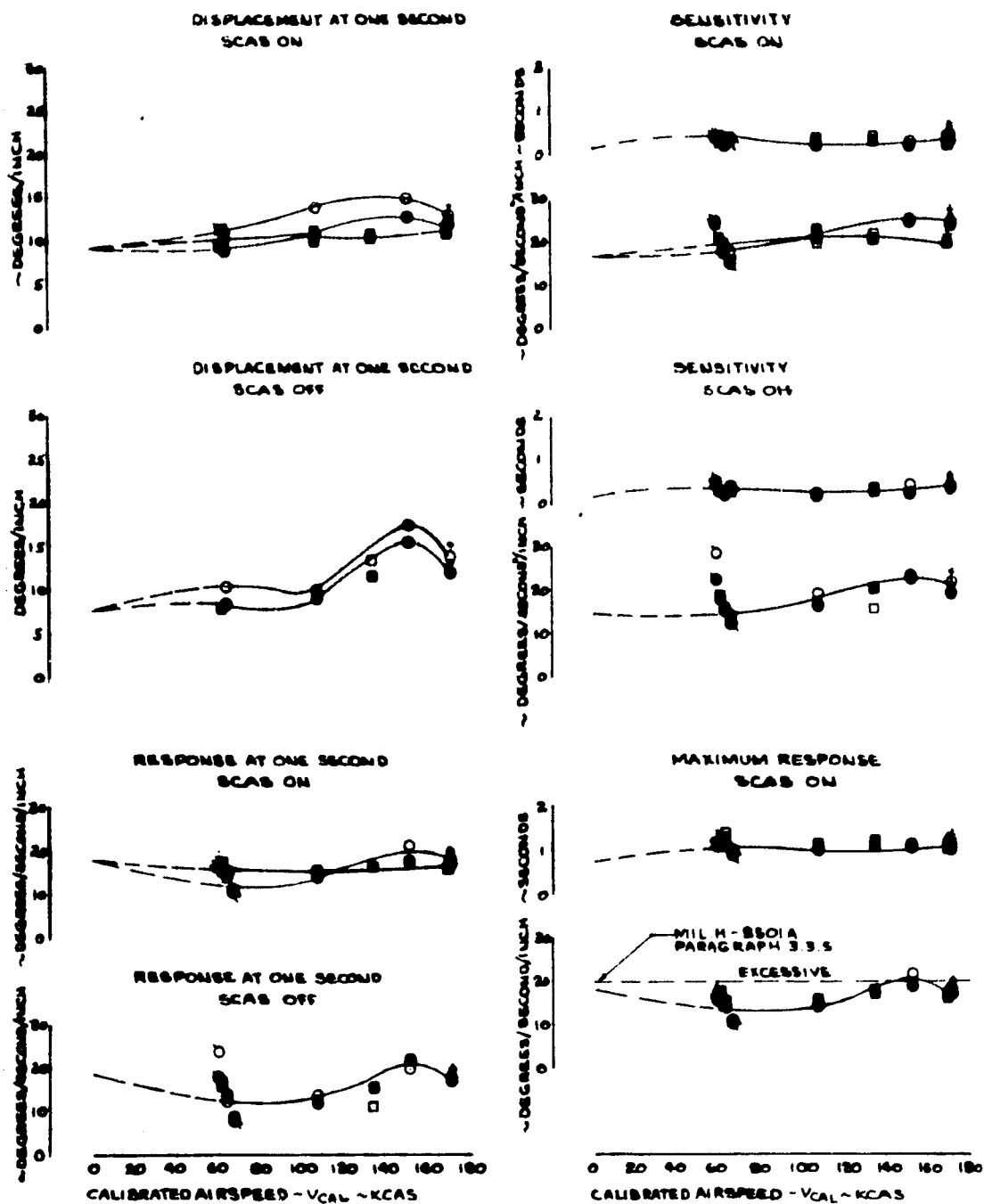


FIGURE NO. 161
LATERAL CONTROLLABILITY SUMMARY
 AN-6 USA 671848
 POS LOADING COMPARISON

SYM	AVG. ALTITUDE H ₀ ~ FT	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. CG ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF. ~ C _T	POS. LOADING
□	4000	8850	195.8 (MID)	324.0	HVT. HOG	0.004441	POS. LOADING
○	5100	8500	195.1 (MID)	325.0	HVT. HOG	0.004441	POS. EMPTY

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
 2. SOLID SYMBOLS DENOTE RIGHT INPUT
 3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
 4. FLAGGED SYMBOLS DENOTE CLIMB
 5. TAILED SYMBOLS DENOTE AUTOROTATION
 6. SYMBOLS WITH CROSS DENOTE DIVE
 7. AUTOROTATIONAL ROTOR SPEED RANGE ~300 → 350 RPM
 8. POINTS DERIVED FROM FIGURES 209 THROUGH 211, APPENDIX III

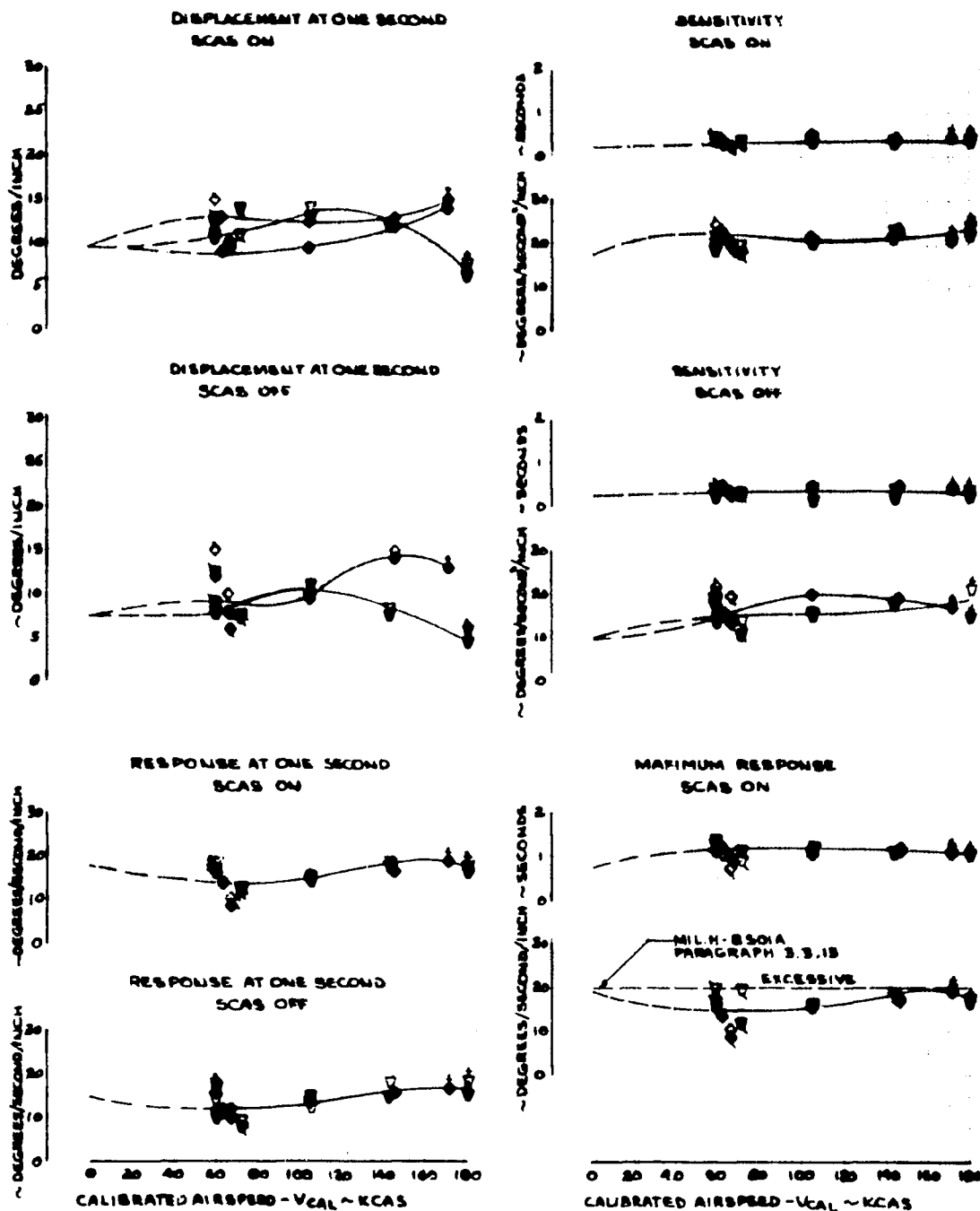


FIGURE NO 162
LATERAL CONTROLLABILITY SUMMARY
AH-1G USAF 716698
CONFIGURATION COMPARISON

SYM.	AVG. ALTITUDE H ₀ ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LANG CG ~ IN.	ROTOR RPM	CONFIG	THRUST ~ C _T	COEFF. PODS LOADING
○	5290	7800	200.2 (AFT)	3240	HVY HOG	0.004534	PODS EMPTY
●	4270	7590	201.2 (AFT)	3240	CLEAN	0.004281	NO PODS

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300-380 RPM
8. POINTS DERIVED FROM FIGURES 192 THROUGH 195 AND 216 THROUGH 218, APPENDIX VII

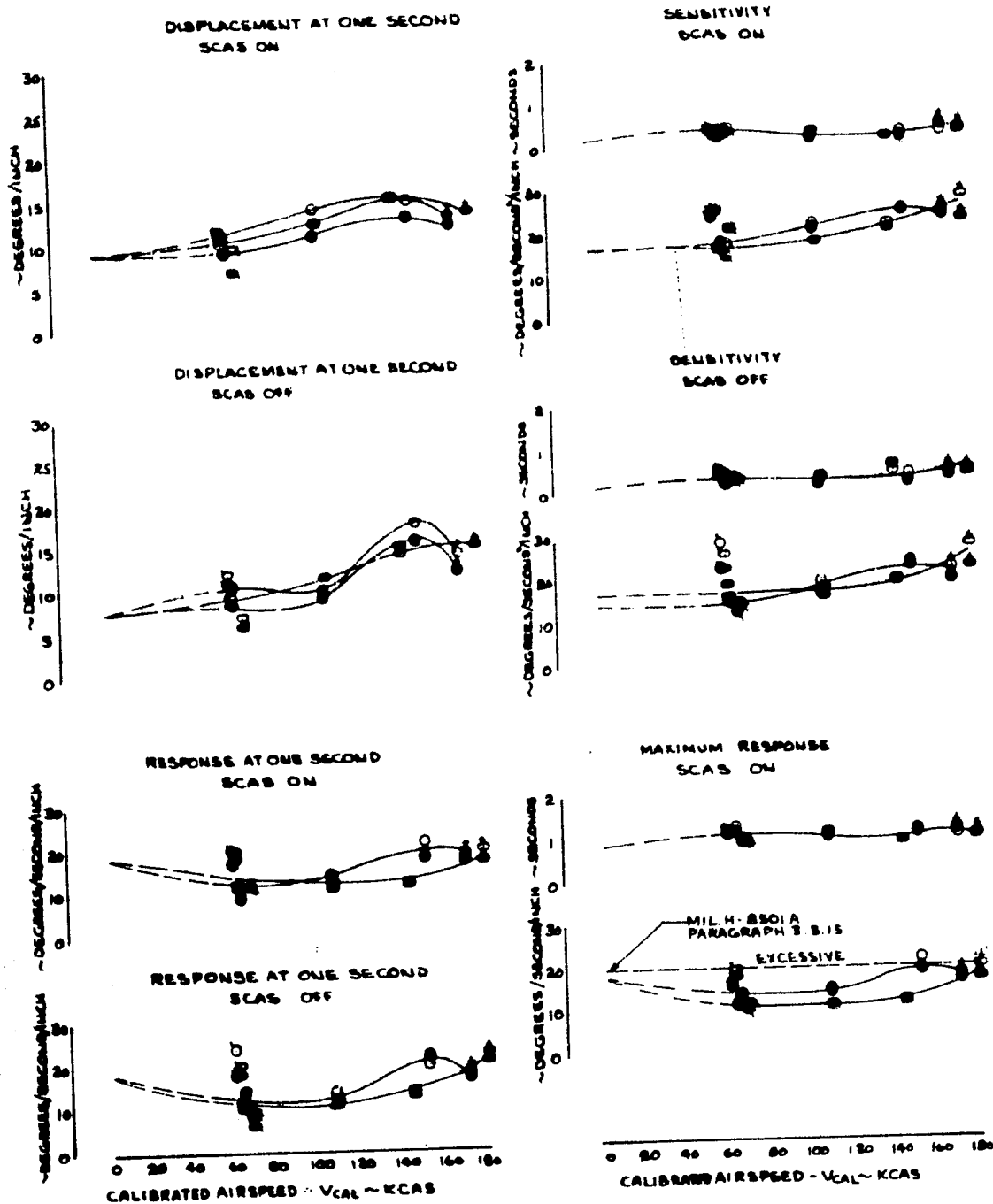


FIGURE NO. 163
LATERAL CONTROLLABILITY SUMMARY
AH-1G USAF 715695
ALTITUDE COMPARISON

SYM	AVG. ALTITUDE H ₀ ~ FT.	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG.	THRUST COEFF.	PODS LOADING
○	5290	7800	200.2	324.0	HVY. HOG	0.004534	PODS EMPTY
△	16150	7730	200.9	324.0	HVY. HOG	0.006836	PODS EMPTY

- NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATION ROTOR SPEED RANGE ~ 300-330 RPM
8. POINTS DERIVED FROM FIGURES 216 THROUGH 222, APPENDIX VII

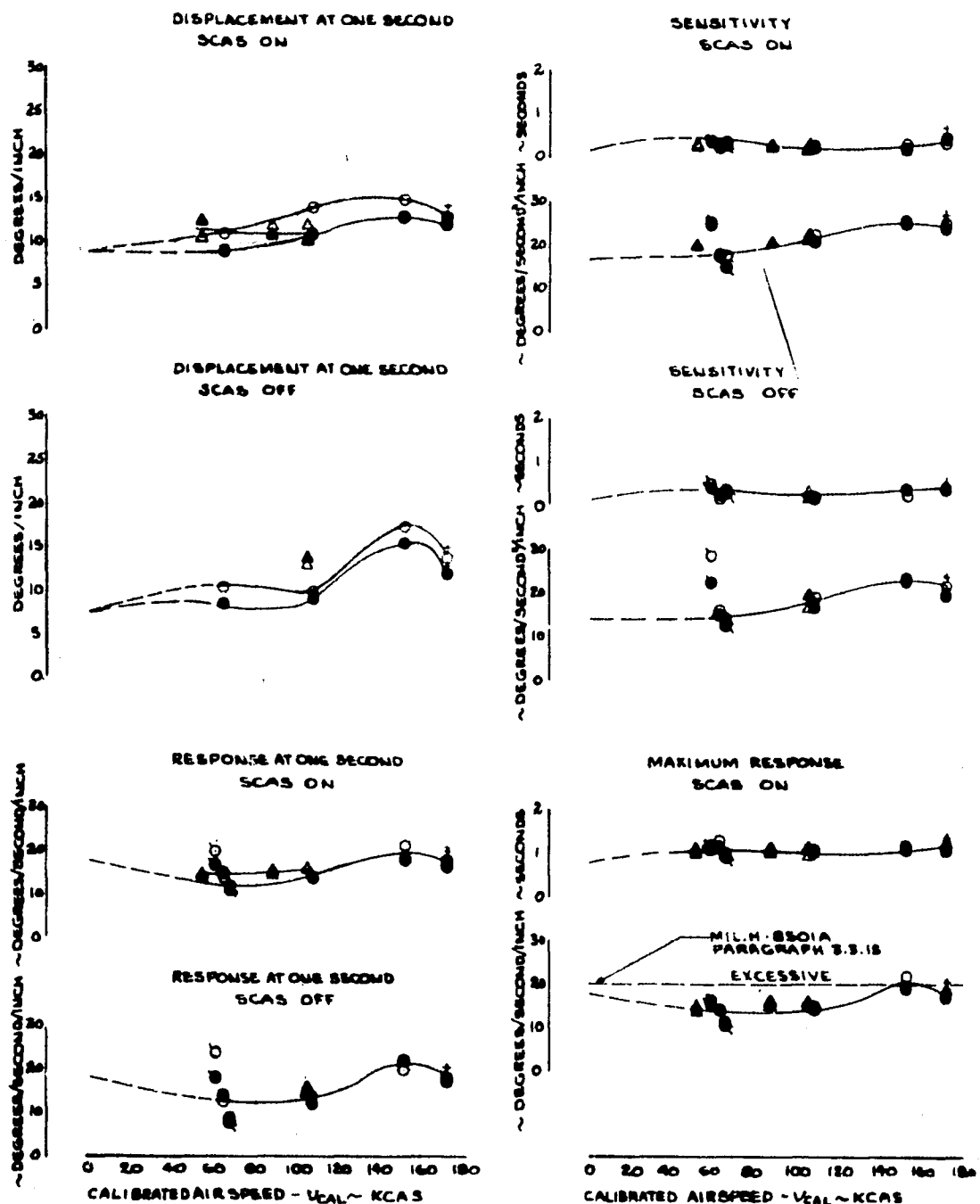
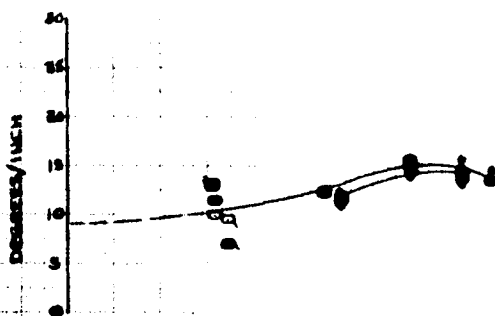


FIGURE No 164
LATERAL CONTROLLABILITY SUMMARY
AH-1G

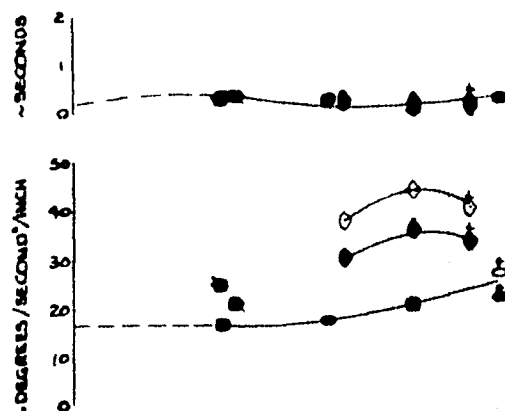
SYM.	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	THRUST COEFF. ~ C _T	CONFIGURATION	S/N
○	4270	7590	201.2 (AFT)	324.0	0.004218	CLEAN	715685
◊	4070	7840	199.5 (AFT)	323.0	0.004188	CLEAN (LANDING GEAR CROSS TUBE FAIRINGS REMOVED)	615247

NOTES: OPEN SYMBOLS DENOTE LEFT INPUT
 2. SOLID SYMBOLS DENOTE RIGHT INPUT
 2. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
 4. FLAGGED SYMBOLS DENOTE CLIMB
 5. TAILED SYMBOLS DENOTE AUTOROTATION
 6. SYMBOLS WITH CROSS DENOTE DIVE
 7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 300 → 330 RPM
 8. POINTS DERIVED FROM FIGURES 192 THROUGH 199, APPENDIX III

**DISPLACEMENT AT ONE SECOND
SCAS ON**



**SENSITIVITY
SCAS ON**



**RESPONSE AT ONE SECOND
SCAS ON**

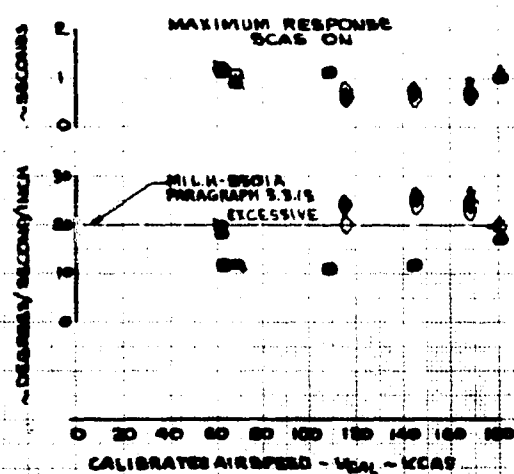
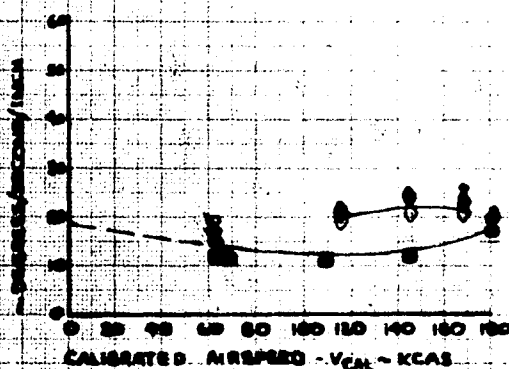


FIGURE NO. 165
DIRECTIONAL CONTROLLABILITY SUMMARY
AH-1G USAF/USMC
GROSS WEIGHT COMPARISON

SYM	AVG. ALTITUDE H ₀ ~ FT	AVG. GROSS WEIGHT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	CONFIG. HOG	THRUST COEFF. ~ CT	PODS LOADING
0	4630	7640	200.5 (FT)	824 (H.V.)	HOG	0.004556	PODS EMPTY
1	6060	9280	208.2 (FT)	824 (H.V.)	HOG	0.005522	PODS LOADED (634-LB TOTAL)

- NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
2. SOLID SYMBOLS DENOTE RIGHT INPUT
3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS DENOTE CLIMB
5. TAILED SYMBOLS DENOTE AUTOROTATION
6. SYMBOLS WITH CROSS DENOTE DIVE
7. AUTOROTATIONAL ROTOR SPEED RANGE ~ 800-830 RPM
8. POINTS DERIVED FROM FIGURES 231 THROUGH 255, APPENDIX XII

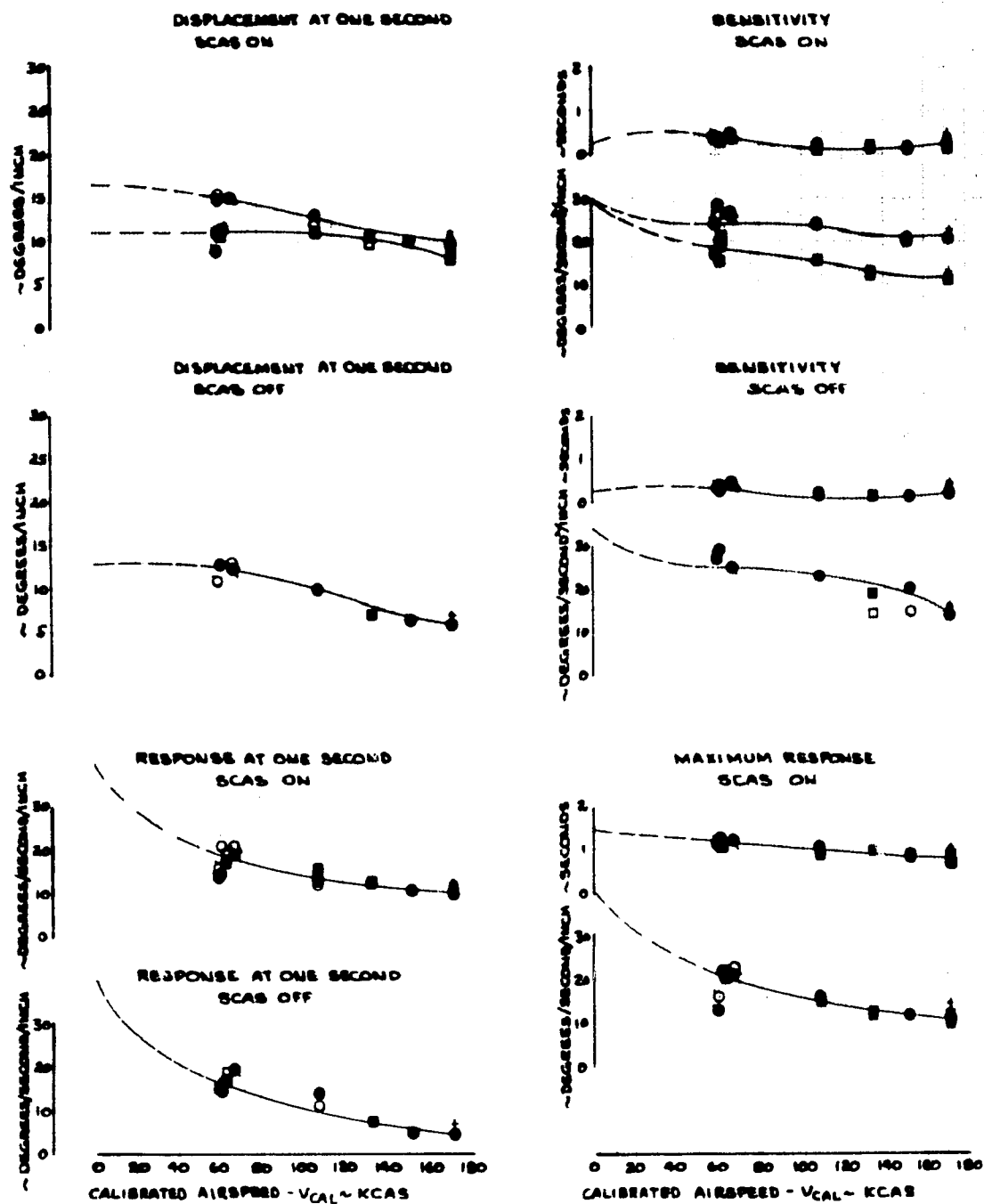
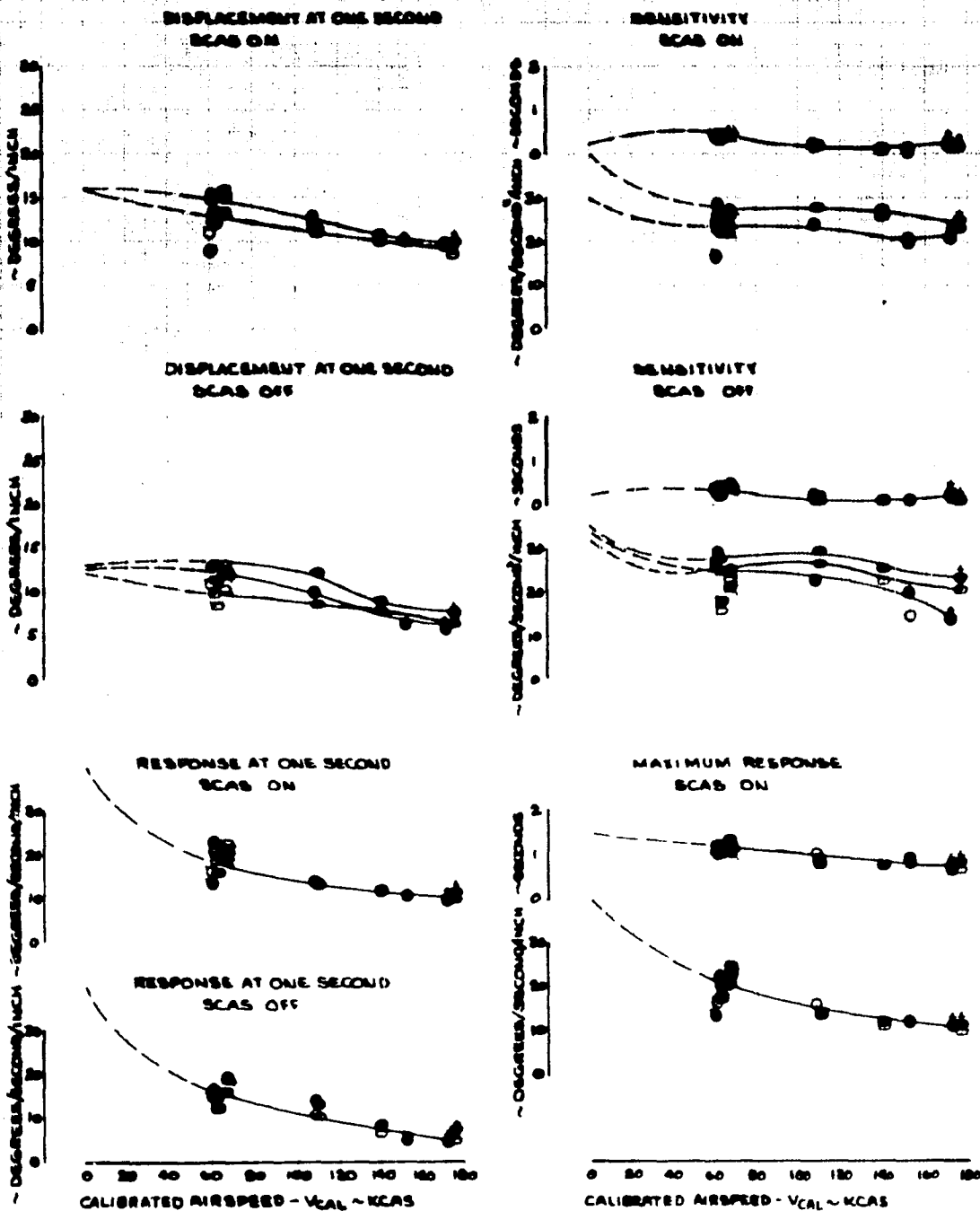


FIGURE NO. 166
DIRECTIONAL CONTROLLABILITY SUMMARY
 AH-1G USA 14718498
 CONFIGURATION CONTINUOUS

SYM	AVE. ALTITUDE H ₀ ~ FT.	AVE. GROSS WEIGHT ~ LB.	AVE. ENGINE SPEED C ₀ ~ RPM	ENGINE THROTTLE C ₀ ~ %	ENGINE TEMP. ~ °C	ENGINE LOADING
0	4650	7640	2000 (MPT) 2250	WTF HNS	0.004529	PODS EMPTY
1	5900	7480	2010 (MPT) 2250	CLEAN	0.004480	NO PODS

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT
 2. SOLID SYMBOLS DENOTE RIGHT INPUT
 3. PLAIN SYMBOLS DENOTE LEVEL FLIGHT
 4. PLACED SYMBOLS DENOTE CLIMB
 5. TAILED SYMBOLS DENOTE AUTOROTATION
 6. SYMBOLS WITH CROSS DENOTE DIVE
 7. AUTOROTATIONAL SPEED RANGE ~ 200 ~ 225 RPM
 8. POINTS DERIVED FROM FIGURES 223 THROUGH 225, AND 225 THROUGH 228, APPENDIX III



AM-16 USA 671369A

STATION	AWS. ALTITUDE ~ FT	AWS. CROSS HEIGHT ~ LB	AWS. LEAD C.L. ~ LB	SHOTS ~ LB	LEADS ~ LB	TARGET COUNT	SCORE
●	4650	7640	2000000	2000	1000000	0-000000	POSS EMPTY
▲	10000	10000	2000000	2000	1000000	0-000000	POSS EMPTY

NOTES: 1. OPEN SYMBOLS REMOTE LEFT MOUNT
2. SOLID SYMBOLS REMOTE RIGHT MOUNT
3. PLAIN SYMBOLS REMOTE LEVEL FLIGHT
4. FLAGGED SYMBOLS REMOTE CLIMB
5. TAILED SYMBOLS REMOTE ACCELERATION
6. SYMBOLS WITH CIRCLES REMOTE TURN
7. ANTERIOR/INTERNAL ENTER SPEED SPACE - 200-400 MPH
8. POINTS DERIVED FROM FIGURES 222 THROUGH 229, AND
222 THROUGH 229, APPENDIX 22

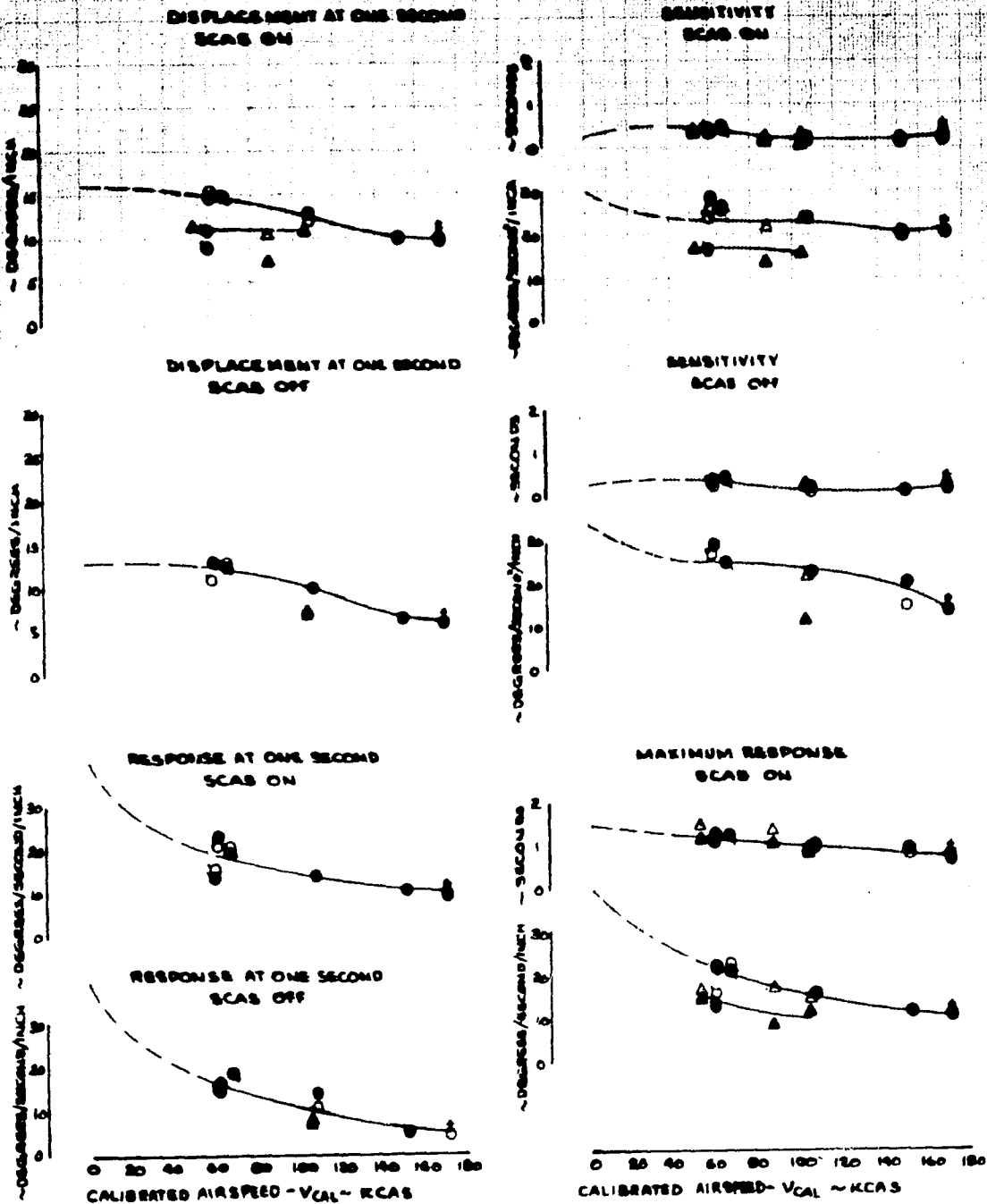
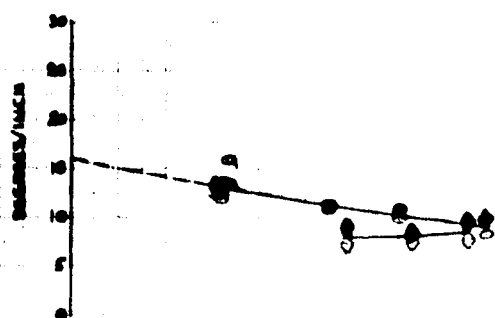


FIGURE No. 168
DIRECTIONAL CONTROLLABILITY SUMMARY
AH-1G USAF 710675

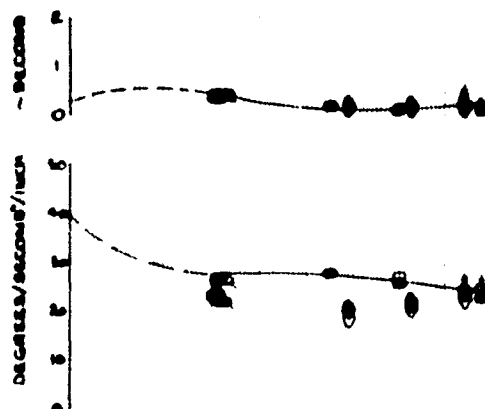
SYM	AVE ALT H ₀ -FE	AVE G-M ~LB	AVE LONG C.G. ~IN	NOTE	THRUST BPM	COEFF	CONFIGURATION	W/H
0	5000	1000	2012000	5240	0.004400		CLEAN	710675
0	4800	8000	1913000	5220	0.004762		CLEAN (AIRMAN'S SEAT GUNNERS CROSS TUBE REMOVED)	

NOTES: (1) PPM SYMBOL DENOTE LEFT INPUT
 (2) SOLID SYMBOL DENOTE RIGHT INPUT
 (3) PLAIN SYMBOL DENOTE LEVEL FLIGHT
 (4) FLAGGED SYMBOL DENOTE CLIMB
 (5) TAILED SYMBOL DENOTE AUTOROTATION
 (6) SYMBOLS WITH CROSS DENOTE DIVE
 (7) AUTOROTATIONAL TORQUE SPEED RANGE ~ 200 ~ 250 RPM
 (8) POINTS DERIVED FROM FIGURES 223 THROUGH 230, APPENDIX III

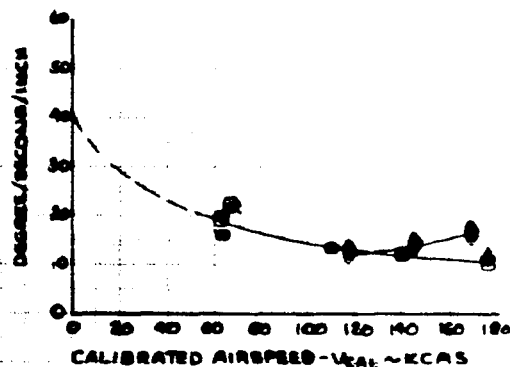
**DISPLACEMENT AT ONE SECOND
SCAS ON**



**SENSITIVITY
SCAS ON**



**RESPONSE AT ONE SECOND
SCAS ON**



**MAXIMUM RESPONSE
SCAS ON**

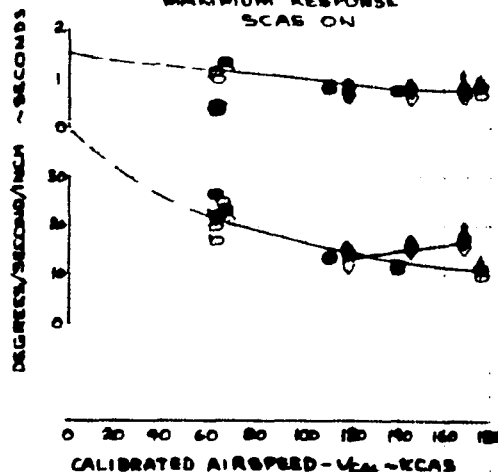
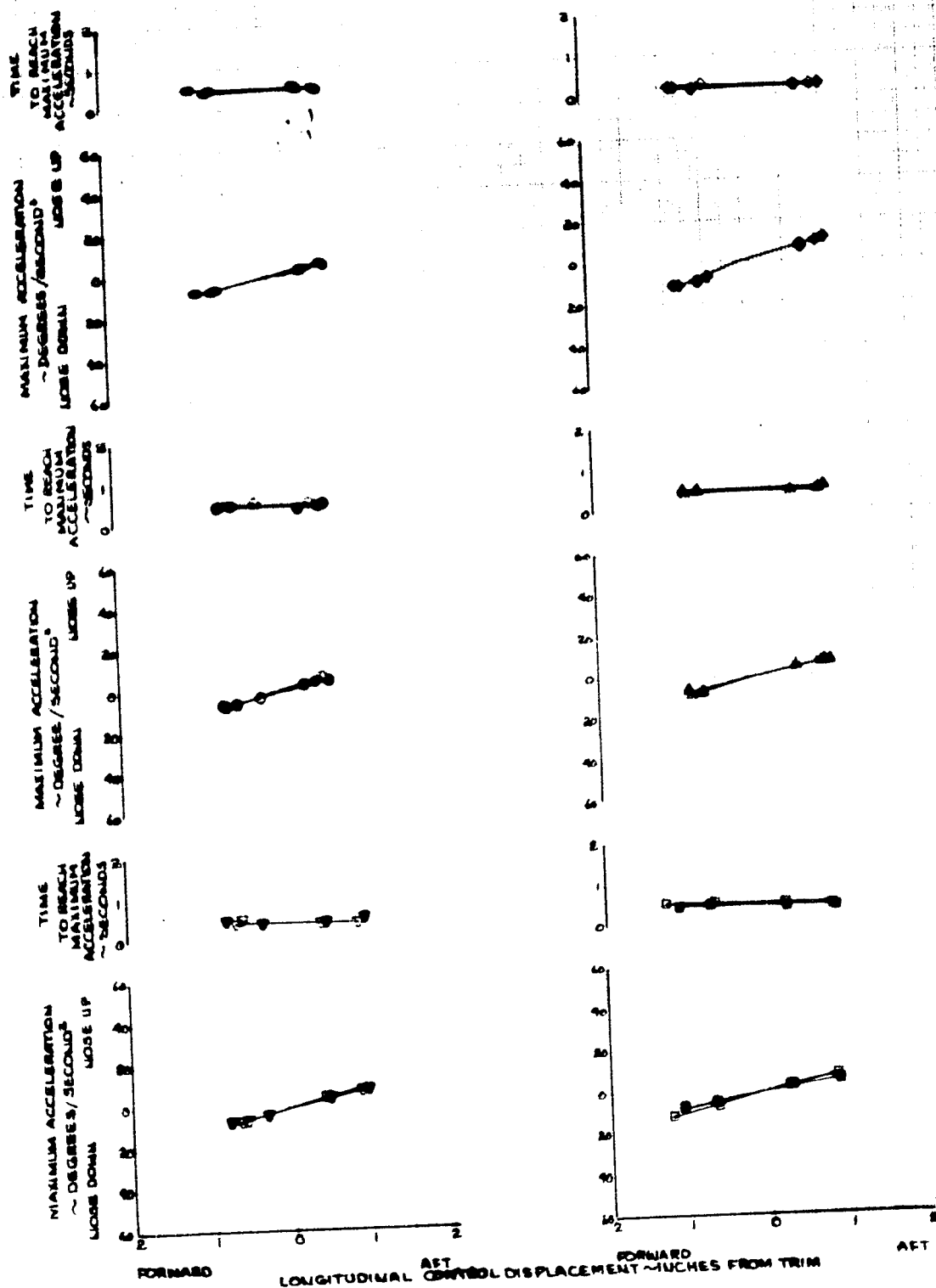


FIGURE No. 169
LONGITUDINAL CONTROL SENSITIVITY
 AN-10 USAF 715648
 CLEAN CONFIGURATION

SYM	AIR SPEED ~ CAS	AVE. ALT H ₀ ~ FT	AVE. GWT ~ LB	AVE. LONG C.G. ~ IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~ C _T
0000	62.0	3900	1850	100.8 (700)	325.0	LEVEL FLIGHT	0.004397
0000	105.0	4450	1850	100.8 (700)	325.0	LEVEL FLIGHT	0.004564
0000	135.0	7120	1850	100.4 (700)	325.0	LEVEL FLIGHT	0.004564
0000	172.0	6600	1850	100.4 (700)	325.0	DIVE	0.004827
0000	52.5	3120	1850	100.4 (700)	325.0	CLIMB	0.004725
0000	52.5	7240	1720	100.5 (700)	325.0	AUTOROTATION	0.004771

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF



TIME	ALTITUDE	AIR ALT	AIR ALT	AIR ALT	ENGINE	FLIGHT CONDITION	THRUST	CHAS
000000	000000	000000	000000	000000	0000	LEVEL FLIGHT	000000	000000
000000	000000	000000	000000	000000	0000	LEVEL FLIGHT	000000	000000
000000	000000	000000	000000	000000	0000	LEVEL FLIGHT	000000	000000
000000	000000	000000	000000	000000	0000	CLIMB	000000	000000
000000	000000	000000	000000	000000	0000	CLIMB	000000	000000
000000	000000	000000	000000	000000	0000	AUTOMATICALLY	000000	000000



FIGURE NO. 171
LONGITUDINAL RESPONSE AT ONE SECOND
 AH-1G USA 6718693
 CLEAN CONFIGURATION

SYM	AIRSPED ~CAS	AVG. ALT H ₀ ~ FT	AVG. GENT ~ LB	AVG. LONG. CG ~ IN.	ROTOR RPM	FLIGHT MODE	TIME ~ CT
○	65.0	3000	7160	100.0 (700)	3200	LEVEL FLIGHT	0.000000
□	100.0	6100	7300	100.0 (700)	3200	LEVEL FLIGHT	0.000000
◇	120.0	7100	7300	100.0 (700)	3200	LEVEL FLIGHT	0.000000
△	170.0	6600	6900	100.0 (700)	3200	DIVE	0.000000
□	65.5	5400	7400	100.0 (700)	3200	CLIMB	0.000000
□	65.5	7200	7700	100.0 (700)	3200	AUTOROTATION	0.000000

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF

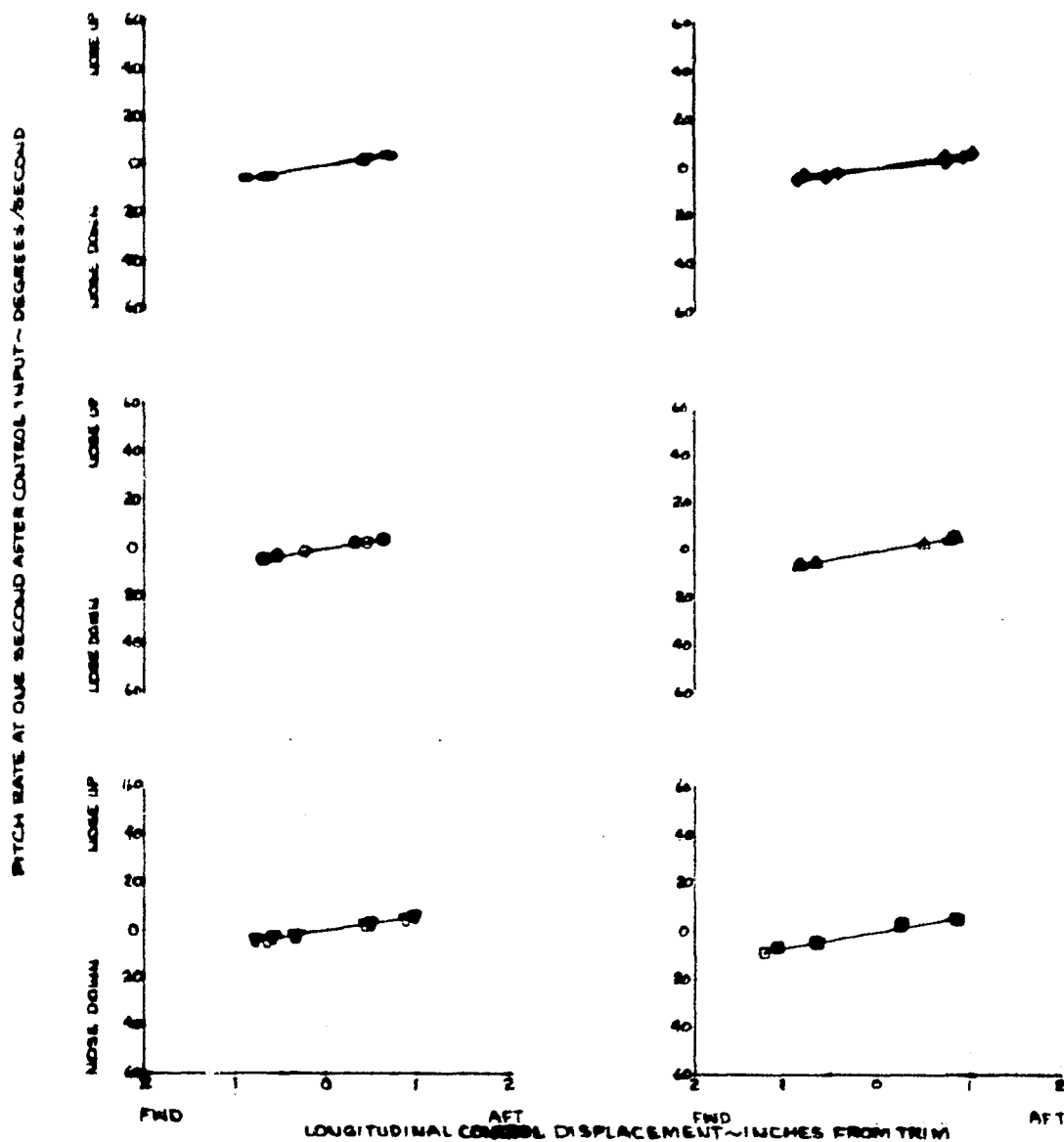


FIGURE NO. 172
LONGITUDINAL CONTROL SENSITIVITY
 AH-1G USAF 715695
 CLEAN CONFIGURATION

SYM	AIR SPEED ~ CAS	AVE. ALT. ~ FT	AVE. GRNT ~ LB	AVE. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST OBSR. ~ C _T
000	62.0	8760	7930	201.3 (AFT)	2200	LEVEL FLIGHT	0.000000
000	112.5	8480	7820	201.1 (AFT)	2200	LEVEL FLIGHT	0.000000
000	145.5	8550	7760	201.2 (AFT)	2200	LEVEL FLIGHT	0.000000
000	171.5	8890	7880	201.2 (AFT)	2200	DIVE	0.000000
000	485	4890	7810	200.8 (AFT)	2200	CLIMB	0.000000
000	485	8910	7920	201.8 (AFT)	2200	AUTO ROTATION	0.000000

NOTE: OPEN SYMBOLS DENOTE SEAS ON
 SOLID SYMBOLS DENOTE SEAS OFF

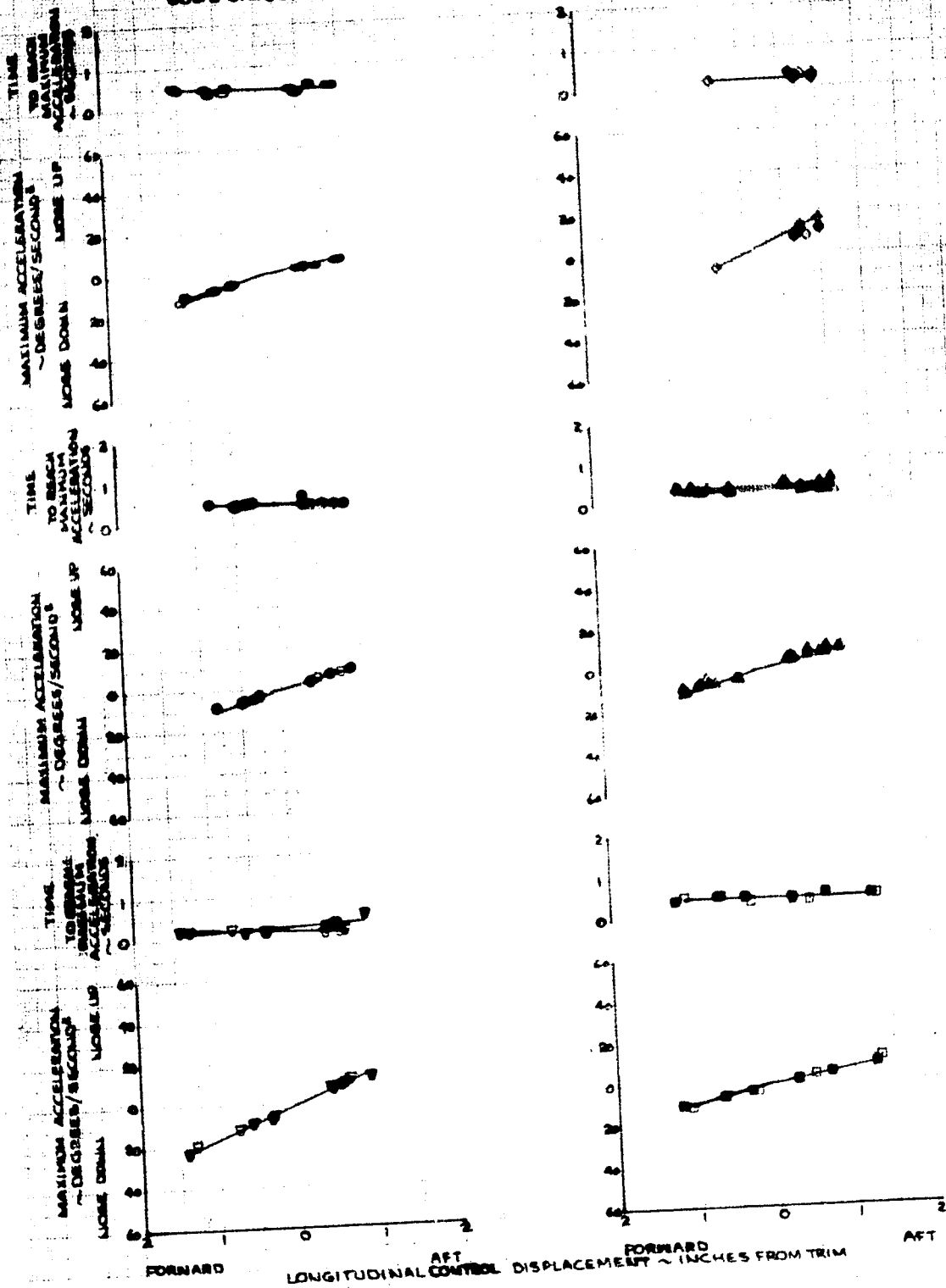


FIGURE NO. 173
 LONGITUDINAL CONTROL RESPONSE
 AM-16 USAF715695
 CLEAN CONFIGURATION
 SCAS ON

SYM	AMP/SEC ~CAS	AVG ALT M ₀ ~ FT	AVG GENT ~ LB	AVG LOUS C.G. ~ IN	PTTS FLIGHT ~ SEC	LEVEL FLIGHT ~ SEC	CLIMB ~ SEC	AUTOSTATION ~ SEC
○	62.0	3760	1490	201.3 (AP)	324	LEVEL FLIGHT	0.00 0.00	0.00 0.00
○	111.8	2460	1310	201.1 (AP)	324	LEVEL FLIGHT	0.00 0.00	0.00 0.00
○	106.8	4080	1160	201.3 (AP)	324	LEVEL FLIGHT	0.00 0.00	0.00 0.00
○	177.8	4090	1000	201.3 (AP)	324	CLIMB	0.00 0.00	0.00 0.00
△	68.8	4090	1010	201.3 (AP)	324	CLIMB	0.00 0.00	0.00 0.00
□	88.8	3570	1920	201.3 (AP)	324	AUTOSTATION	0.00 0.00	0.00 0.00

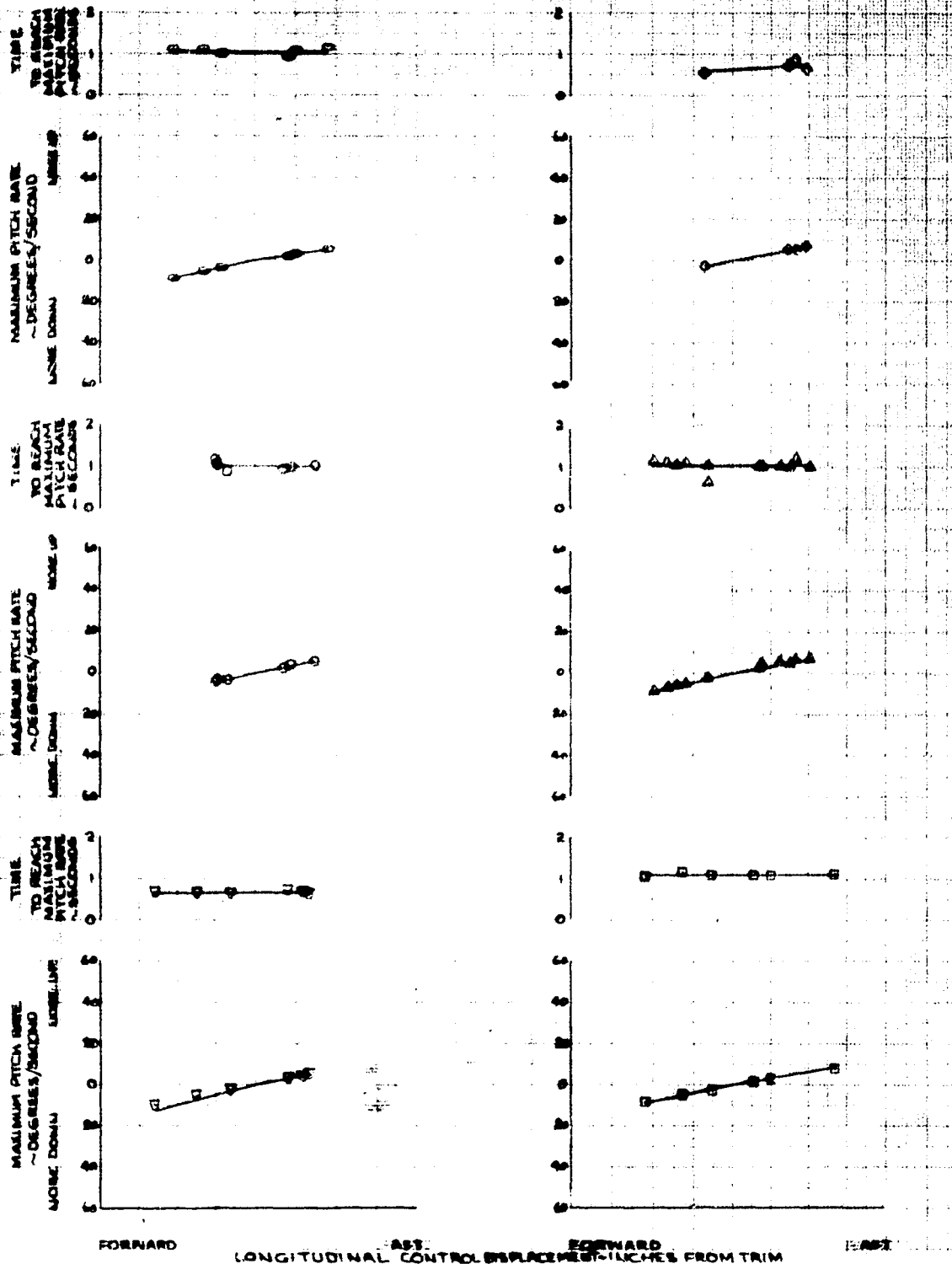


FIGURE NO. 174
 LONGITUDINAL RESPONSE AT ONE SECOND
 AH-64 USAF T156493
 CLEAN CONFIGURATION

SIM	AIR SPEED ~KAS	AIR ALT ~FT.	AIR SENS ~LS	AVG LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST EFF. ~C _T
000	65.0	3150	7970	201.5 (AFT)	2340	LEVEL FLIGHT	0.004402
000	112.5	3450	7850	201.1 (AFT)	2340	LEVEL FLIGHT	0.004392
000	145.5	4550	7750	201.2 (AFT)	2340	LEVEL FLIGHT	0.004411
000	171.5	4850	7650	201.3 (AFT)	2340	DIVE	0.004326
000	62.5	4850	7670	202.0 (AFT)	2340	CLIMB	0.004350
000	62.5	5570	7720	201.5 (AFT)	2340	AUTO ROTATION	0.004340

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF

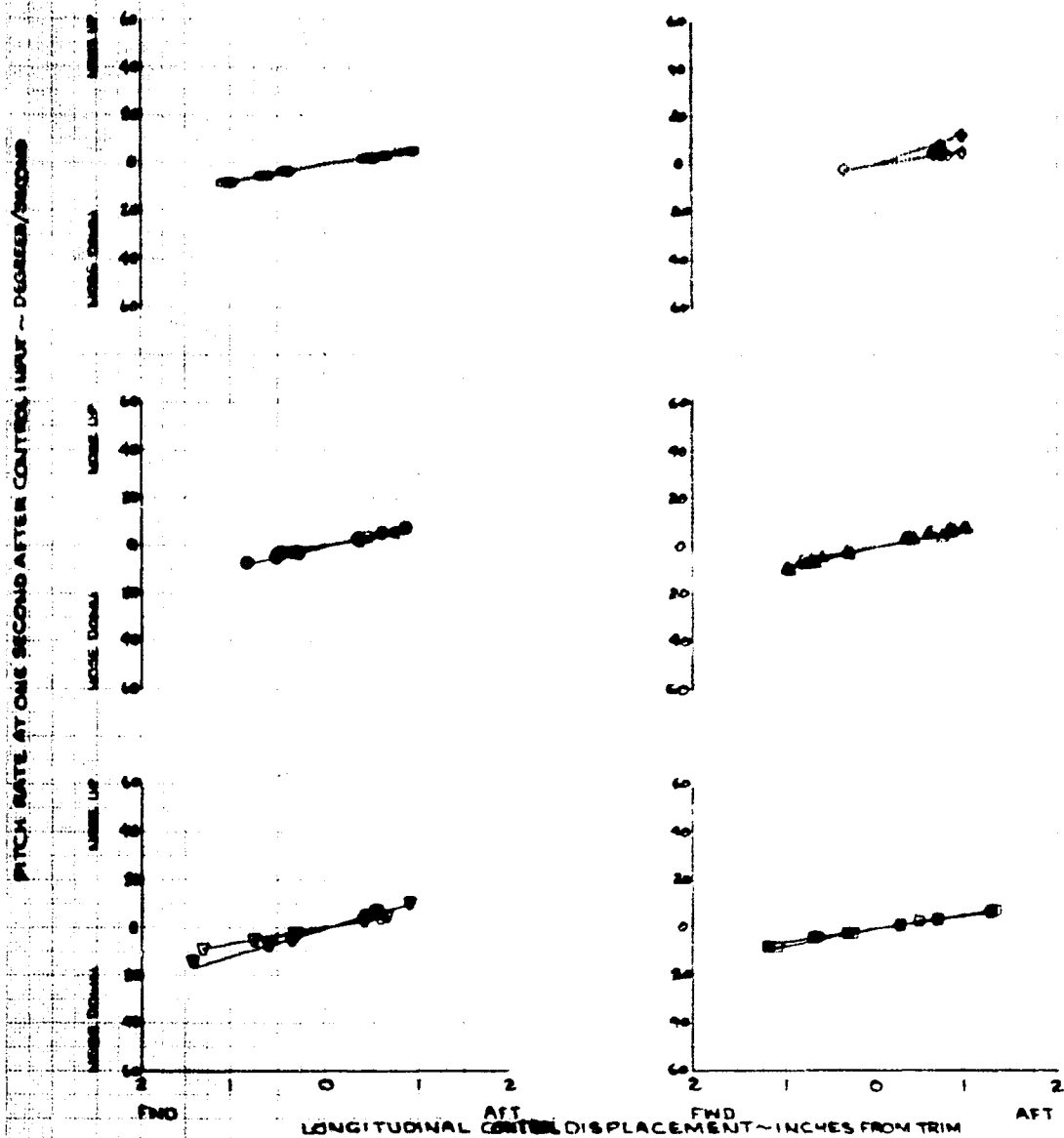


FIGURE No. 175
ANGULAR PITCH DISPLACEMENT
AH-1G USAF TIGERS
CLEAN CONFIGURATION

SYM.	AIR SPEED ~CAS	AVG. ALT. H ₀ ~FT	AVG. SENS ~LB.	AVG. LONG. C.G. ~IN.	SPD. FLIGHT ~MPH	CONSTANT ~CT	TARGET ~CT
○	62.0	3760	7430	201.3(PT)	3340	LEVEL FLIGHT	0.000402
○	116.8	3780	7820	201.1(PT)	3340	LEVEL FLIGHT	0.000202
○	145.5	4550	7760	201.2(PT)	3340	LEVEL FLIGHT	0.000411
○	177.5	4890	7880	201.3(PT)	3340	DIVE	0.000224
△	60.5	4890	7870	201.3(PT)	3340	CLIMB	0.000220
□	68.5	5570	7920	201.3(PT)	3000	AUTOROTATION	0.000940

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

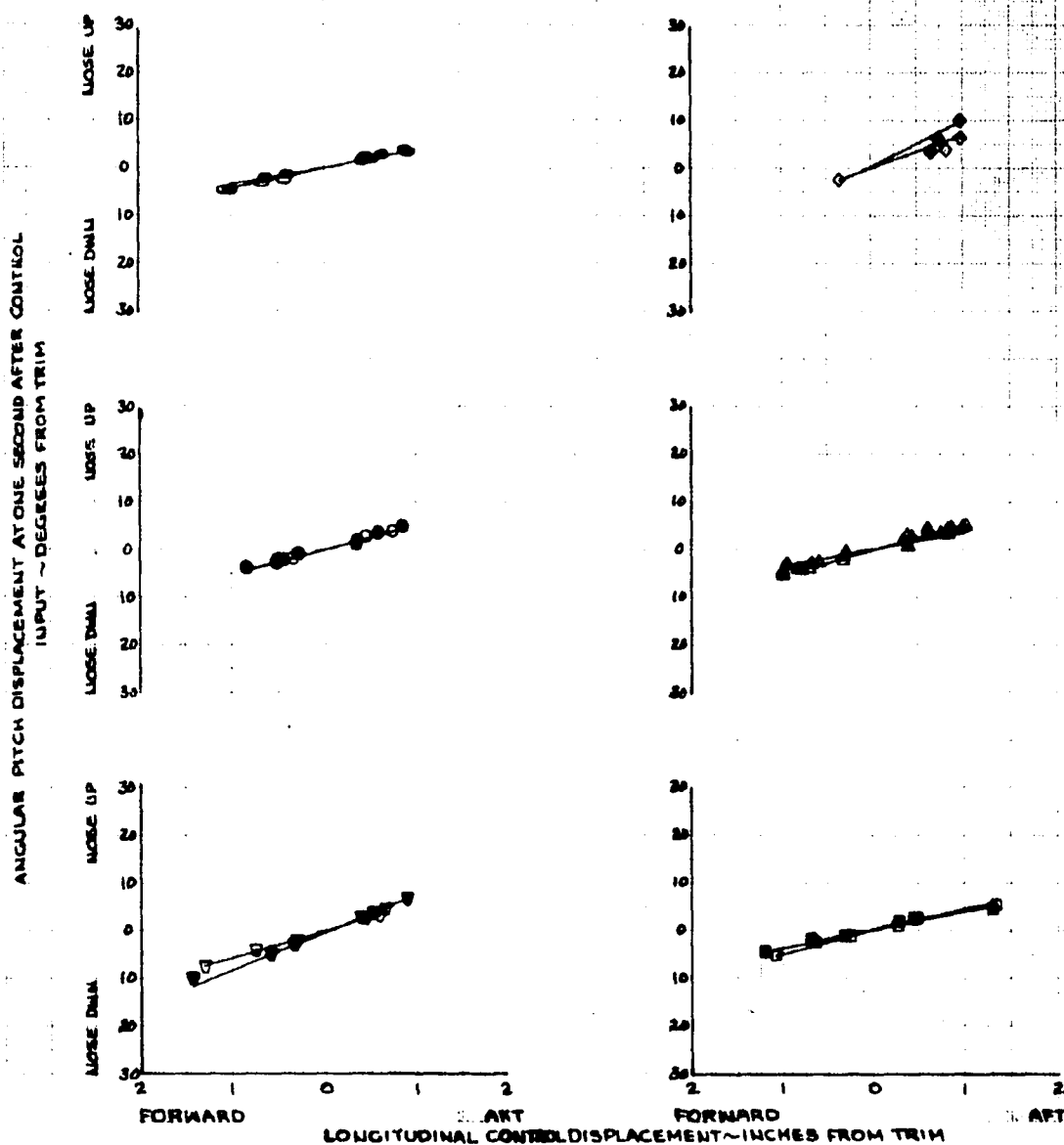


FIGURE NO. 176 LONGITUDINAL CONTROL SENSITIVITY

AH-1G USAF 715695

HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM.	AIR SPEED ~ CAS	AVG. ALT ~ FT	AVG. GWT ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	TRUST COEFF. ~ CT
O	106.0	5550	9160	200.3 (AFT)	3240	LEVEL FLIGHT	0.005367
□	146.0	5140	9830	200.1 (AFT)	3240	LEVEL FLIGHT	0.005899
◇	172.0	7570	9590	200.0 (AFT)	3240	DIVE	0.005978
△	98.0	2730	9630	200.0 (AFT)	3240	CLIMB	0.005183

NOTE: 817 LB. IN OUTSD ROCKET PODS

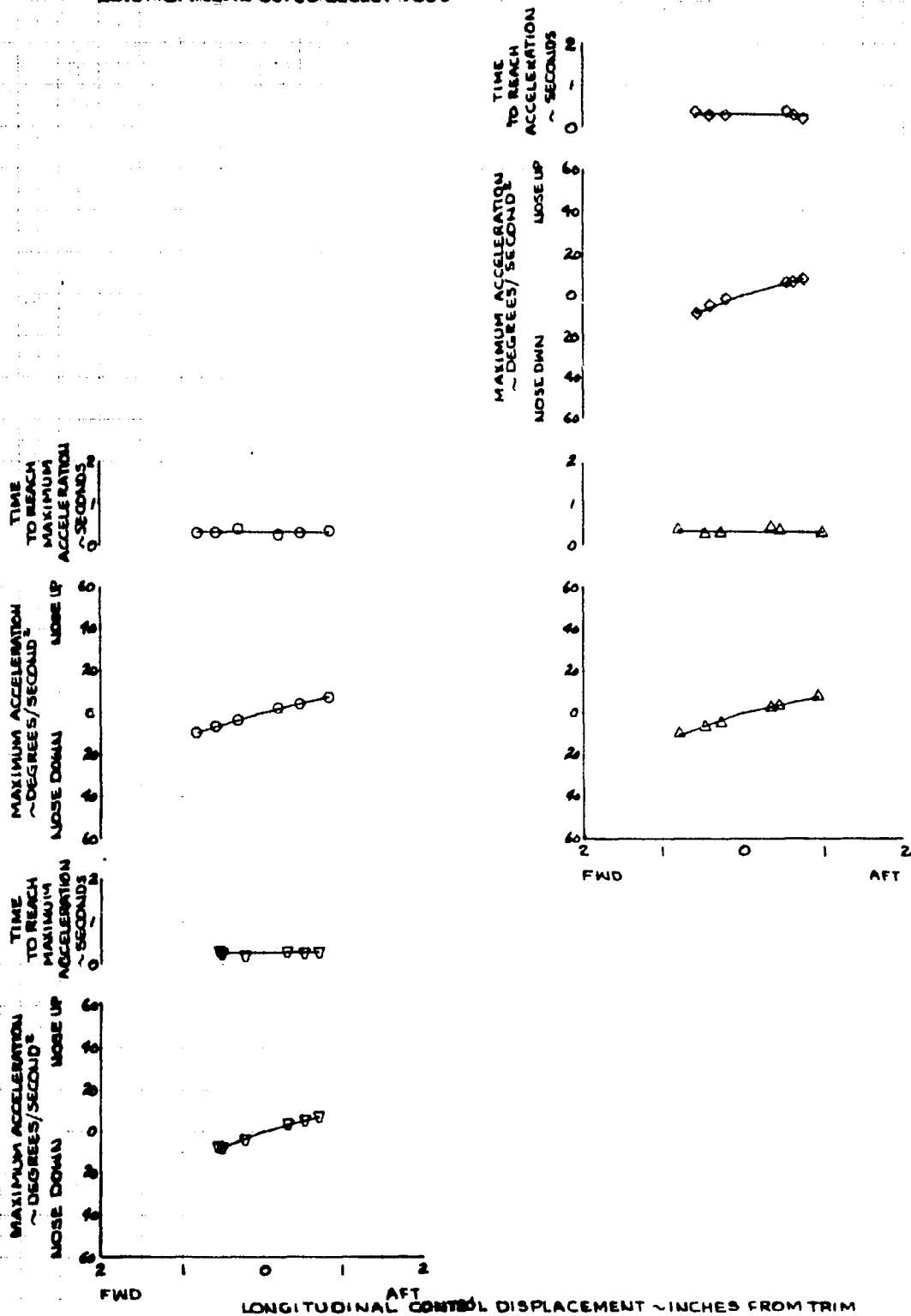


FIGURE NO. 177 LONGITUDINAL CONTROL RESPONSE

AH-1G USAF TI 8698
HVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIR SPEED ~ CAS	AVG. ALT. H ₀ ~ FT.	AVG. GWT. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR FLIGHT CONDITION	THRUST COEFF. ~ C _T
0	106.0	5550	9160	200.3 (AFT)	3240 LEVEL FLIGHT	0.005867
□	146.0	5140	9350	200.1 (AFT)	3240 LEVEL FLIGHT	0.005899
○	172.0	7570	9590	200.0 (AFT)	3240 DIVE	0.005978
Δ	58.0	2730	9630	200.0 (AFT)	3240 CLIMB	0.005183

NOTE: BIT LB. IN OUTSIDE ROCKET POD

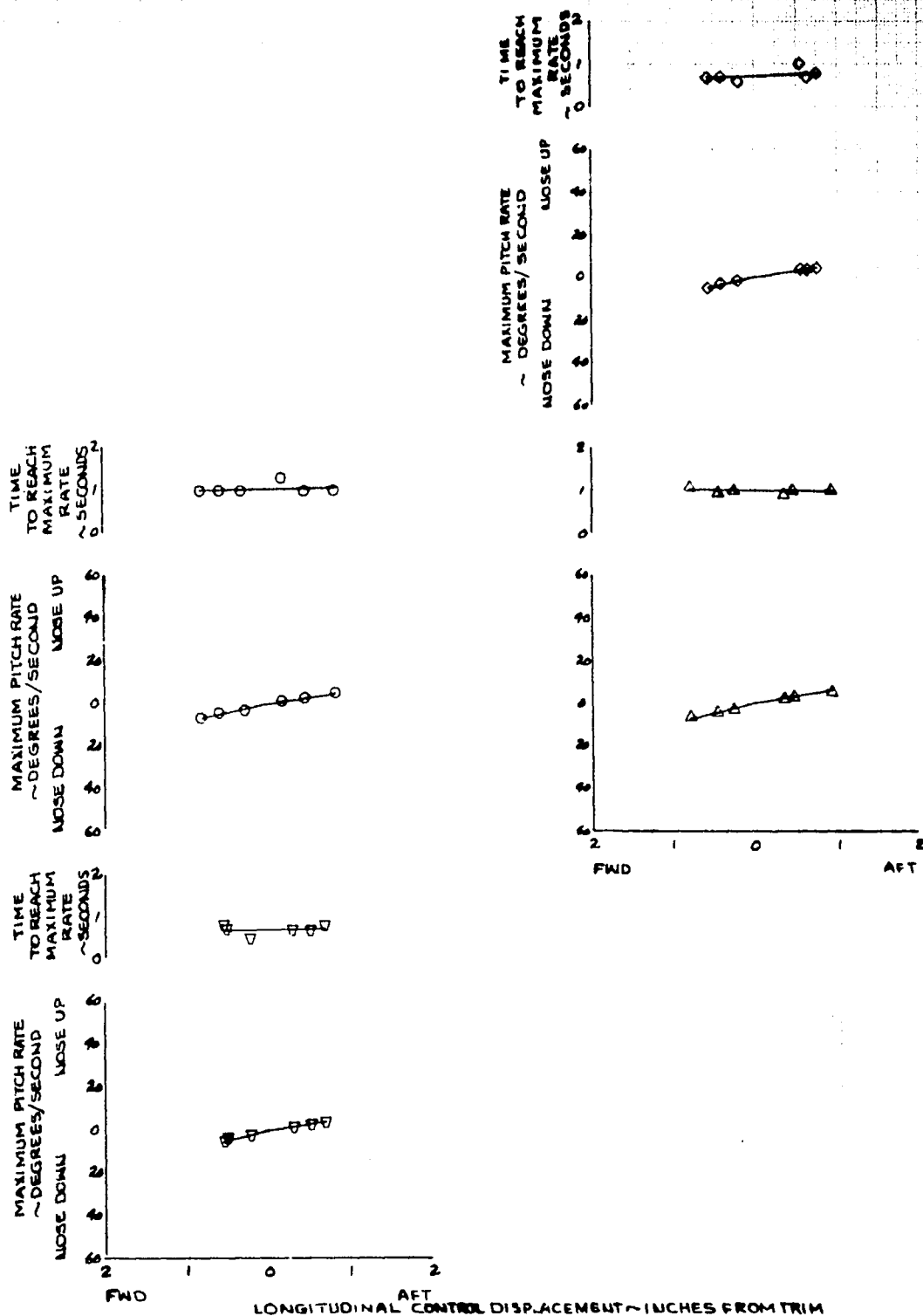


FIGURE No. 178
LONGITUDINAL RESPONSE AT ONE SECOND
 AH-1G USA #715693

HVY. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
 SCAS ON

SYM	AIR SPEED ~ CAS	AVG. ALT. MO ~ FT.	AVG. GRATE ~ LB	LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ CT
○	106.0	5550	9160	200.8(AFT)	3240	LEVEL FLIGHT	0.005867
□	146.0	5140	9330	200.1(AFT)	3240	LEVEL FLIGHT	0.005399
△	172.0	7370	9690	200.0(AFT)	3240	DIVE	0.005978
▲	58.0	2730	9630	200.0(AFT)	3240	CLIMB	0.005183

NOTE: 817 LB. IN. OUTRIG. ROCKET PODS

PITCH RATE AT ONE SECOND AFTER CONTROL INPUT ~ DEGREES/SECOND

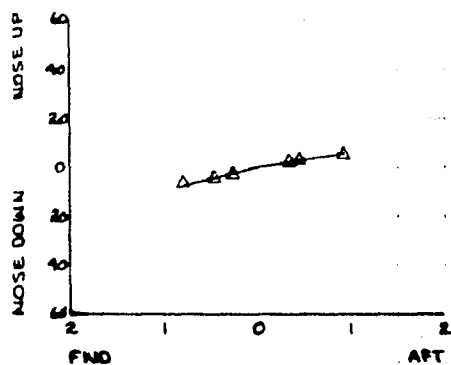
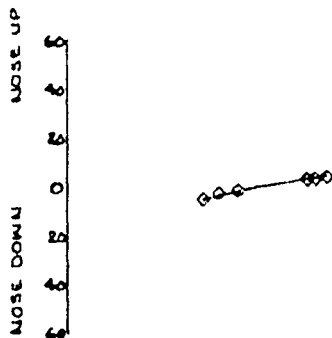
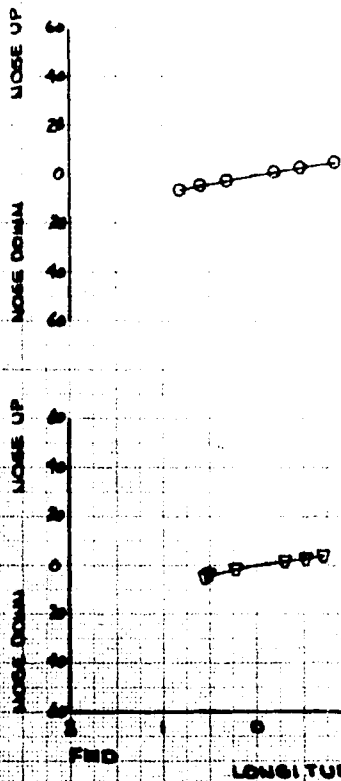


FIGURE NO. 179
ANGULAR PITCH DISPLACEMENT
AN-16 USAF 15678

NAVY SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPED ~CAS	AVG ALT. H ₀ ~FT.	AVG GRNT AND LING. ~LB. C.D.~LB.	ROTOR ~RPM	FLIGHT CONDITION	THRUST COEFF. ~C _T
000	1050	1550	9150	2000 (APT)	LEVEL FLIGHT	0.00 5867
1	1450	800	8900	2000 (APT)	LEVEL FLIGHT	0.00 5399
2	1715	750	8800	2000 (APT)	DIVE	0.00 5978
3	880	1700	9300	2000 (APT)	CLIMB	0.00 5193

NOTE: SIX INCHES OUT OF ROCKET PODS

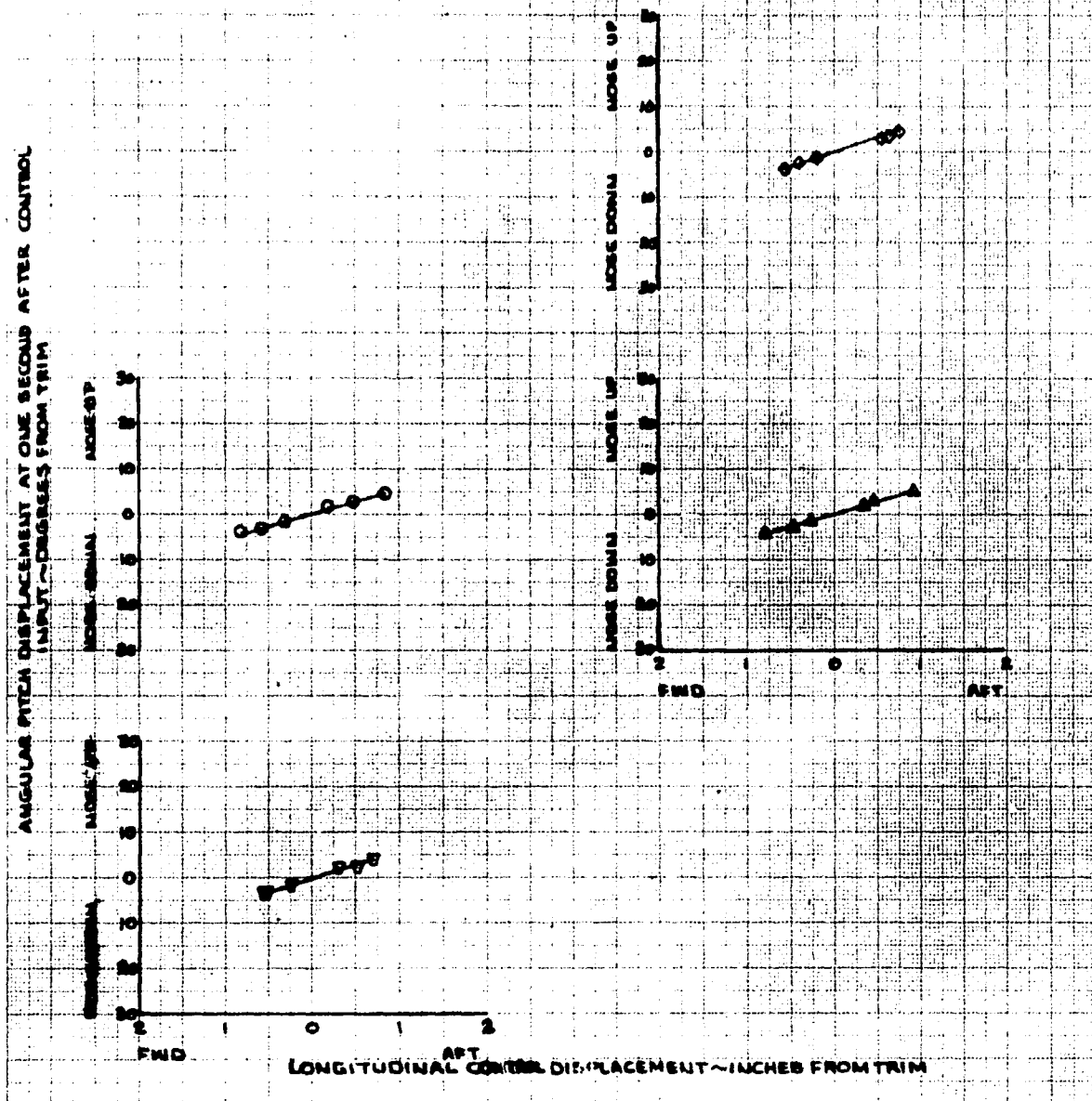


FIGURE No. 180
LONGITUDINAL CONTROL SENSITIVITY
AM-16 USAF/1968
HVV, HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~CAS	Avg. ALT. ~FT.	Avg. SW. ~LB.	Avg. LOAD C.G. ~IN.	NOTES RPM	SLIGHT SENSITION	THROTTLE UP ~CT
020-005	655	8000	8010	200.0 (ATT)	3240	LEVEL FLIGHT	0.004579
	1015	8730	7700	200.0 (ATT)	3240	LEVEL FLIGHT	0.004632
	1625	4710	7140	200.0 (ATT)	3240	LEVEL FLIGHT	0.004658
	1720	4310	8040	200.0 (ATT)	3240	DIVE	0.004821
	600	3460	8010	201.0 (ATT)	3240	CLIMB	0.004434
020-006	655	6730	8010	201.0 (ATT)	3240	AUTOROTATION	0.004882

NOT OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF
 ALL ROCKET PODS EMPTY

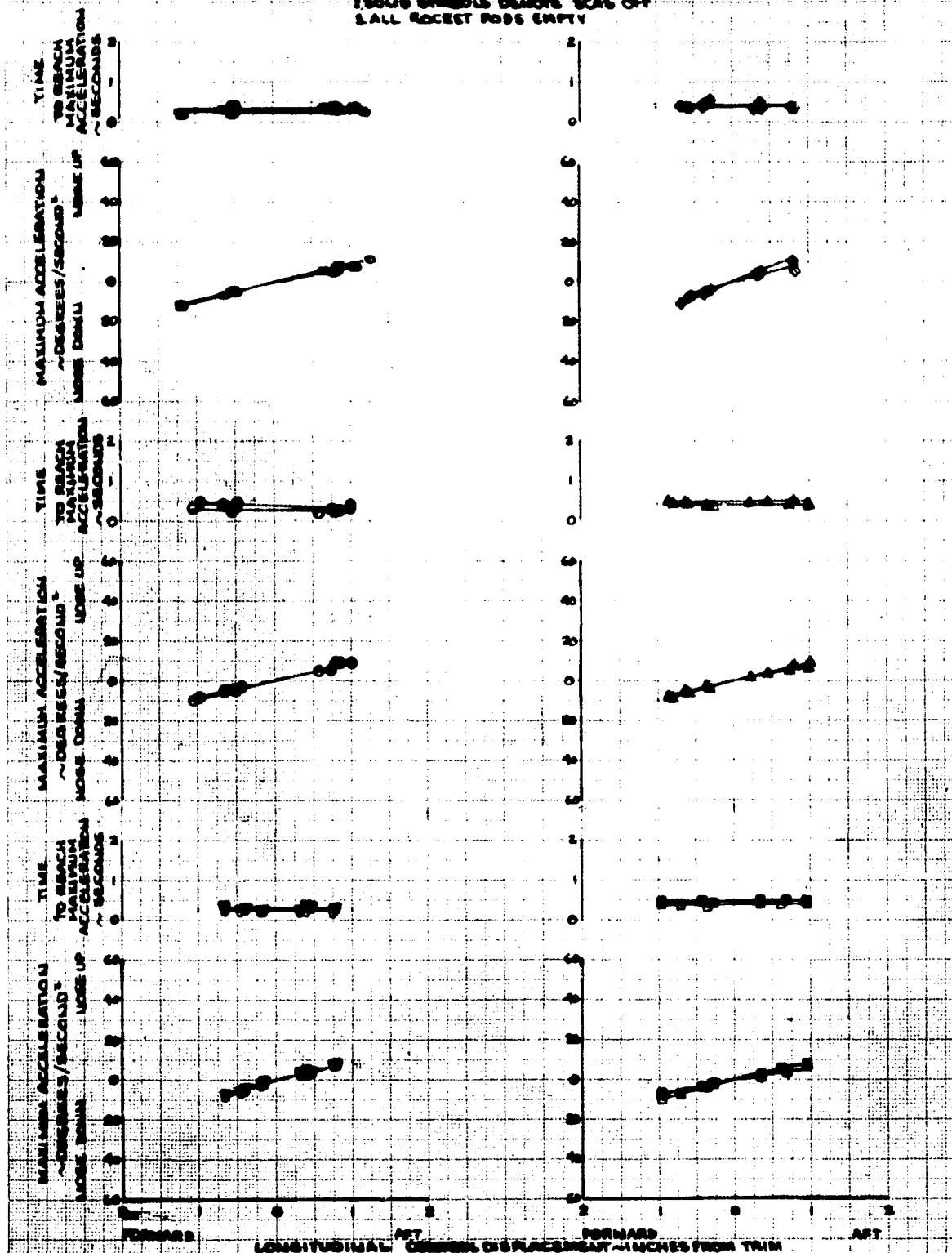


FIGURE NO 181 LONGITUDINAL CONTROL RESPONSE

AM-16 USAF 15645
HYV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCALE ON

SYM	AIRPEED ~ CAS	AVG. ALT H ₀ -FT	AVG. G.M. ~ LB	AVG. LONG. C.G. ~ IN.	POWER HP	FLIGHT CONDITION	ROCKET CODE
0	60.5	3000	8000	200.0 (APT)	124.0	LEVEL FLIGHT	0.006379
0	101.5	3720	7400	200.0 (APT)	124.0	LEVEL FLIGHT	0.004452
0	142.5	4770	7100	200.0 (APT)	124.0	LEVEL FLIGHT	0.004450
0	178.0	5510	6800	200.0 (APT)	124.0	DIVE	0.004020
0	220.0	3460	6000	200.0 (APT)	124.0	CLIMB	0.004439
0	260.0	6120	6000	200.0 (APT)	124.0	AUTOROTATION	0.005332

NOTE: ALL ROCKET PODS EMPTY

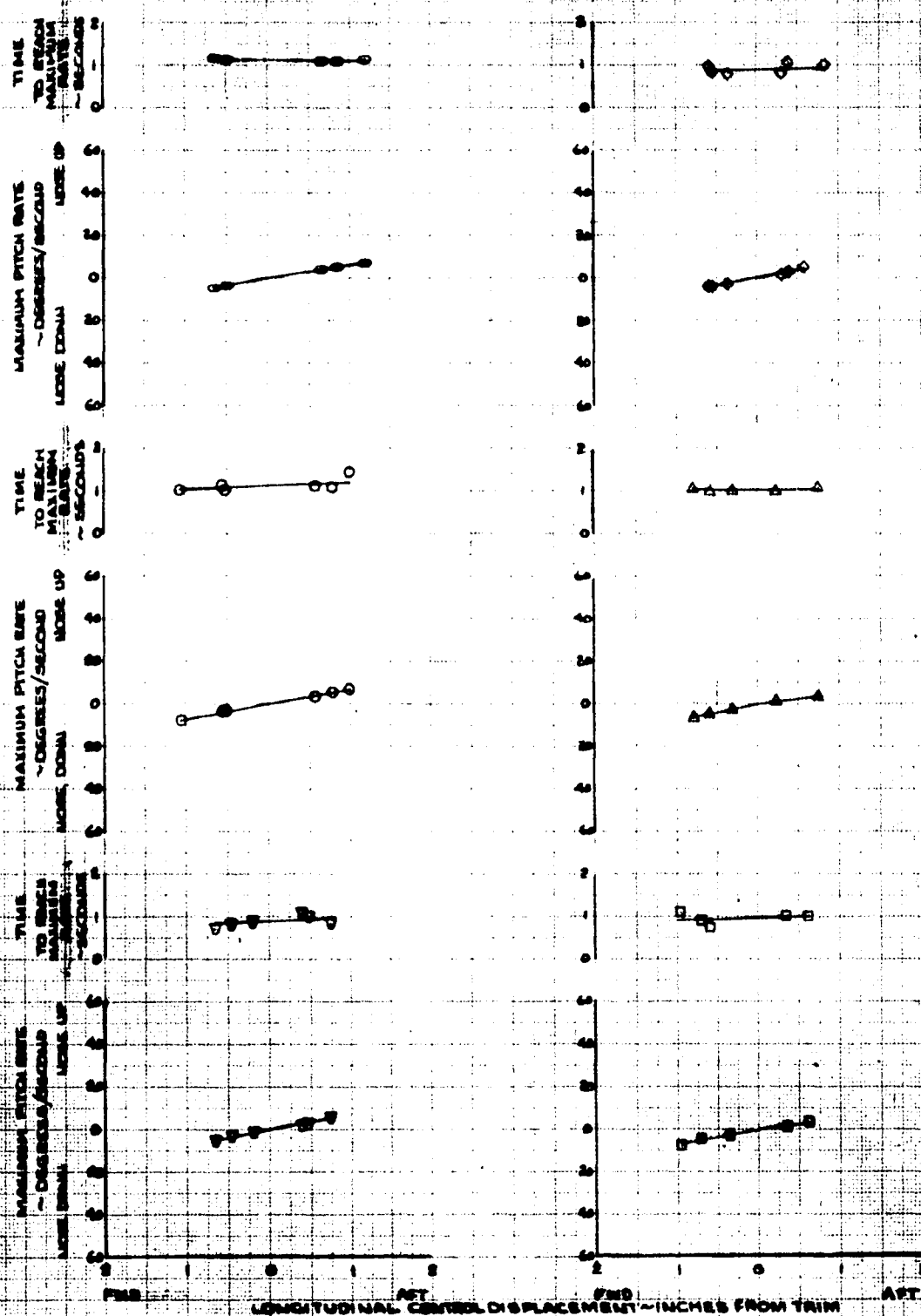


FIGURE No. 182
LONGITUDINAL RESPONSE AT ONE SECOND

AN-10 USAF 715493
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPED ~ CAS	AVG. ALT H ₀ -FT	AVG. G.M. ~ LB	AVG. LONG. CG ~ IN.	MODE	REMARKS	TRIM	CDR
0	60.5	3000	8070	200.9 (AFT)	1340	LEVEL FLIGHT	0.004379	
0	105.3	5420	7480	200.2 (AFT)	1340	LEVEL FLIGHT	0.004481	
0	152.0	4770	7790	200.9 (AFT)	1340	LEVEL FLIGHT	0.004460	
0	172.0	6810	8040	200.9 (AFT)	1340	DIVE	0.004820	
Δ	85.0	3960	8070	201.0 (AFT)	1340	CLIMB	0.004439	
0	65.0	6720	8040	201.0 (AFT)	1340	AUTOROTATION	0.005832	

NEUTRON SYMBOLS DENOTE SCAS ON
ARROW SYMBOLS DENOTE SCAS OFF
BALL ROCKET PODS EMPTY

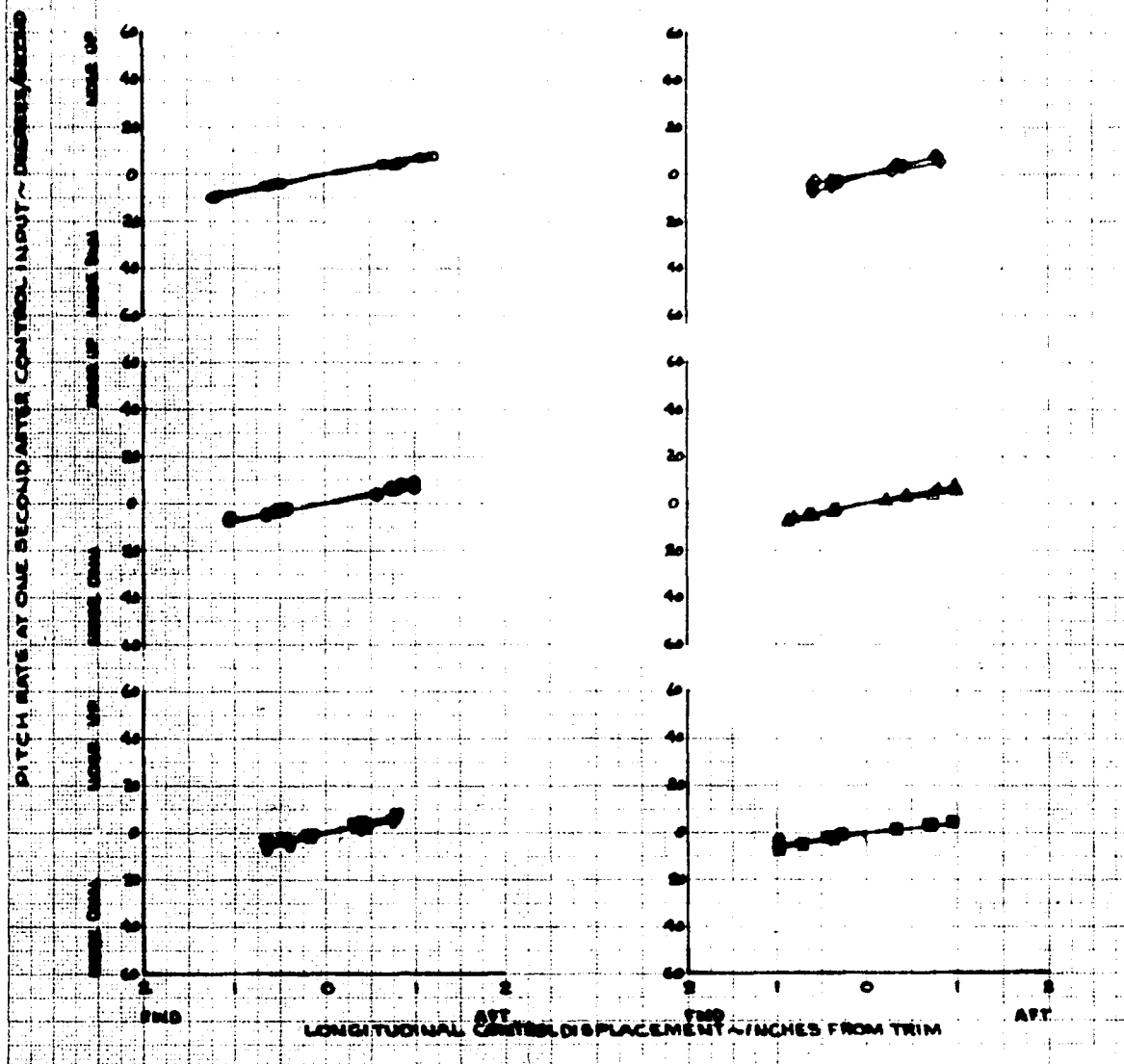


FIGURE No. 183
ANGULAR PITCH DISPLACEMENT

AN-18 USACV-15000
HVV. HOS CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	Avg. ALT. H ₀ ~ FT.	Avg. G.N. ~ LB.	Avg. LONG. C.A. ~ IN.	NOTE	FLIGHT CONDITION	TIME
00	100.0	2000	8070	200.0 (AFT)	3240	LEVEL FLIGHT	0.000000
00	100.0	2000	7000	200.0 (AFT)	3240	LEVEL FLIGHT	0.000000
00	150.0	4170	7170	200.0 (AFT)	3240	LEVEL FLIGHT	0.000000
00	170.0	4310	6040	200.0 (AFT)	3240	DIVE	0.000000
00	60.0	3460	8070	201.0 (AFT)	3240	CLIMB	0.000000
00	60.0	6720	6040	201.0 (AFT)	3240	AUTOROTATION	0.000000

NOTES: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS EMPTY

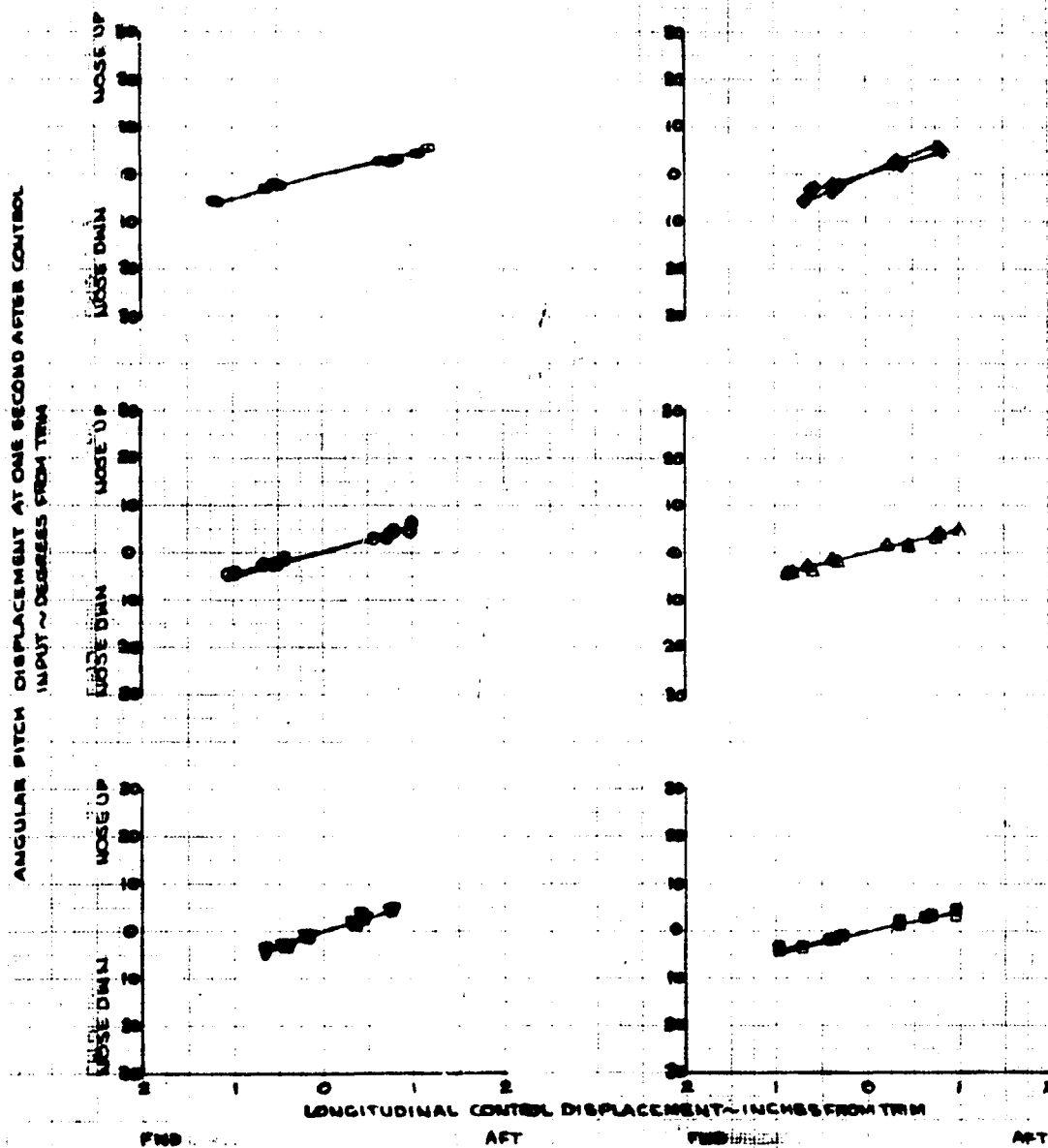


FIGURE NO. 184 LONGITUDINAL CONTROL SENSITIVITY AM-1B USA 5215575

NAV. MOD. CONSIDERATIONS WITH REMOVED FAIRINGS REMOVED

WIND	APPROX. ALT. - CAS	APPROX. ALT. - FT	APPROX. ALT. - LB	APPROX. ALT. - IN.	APPROX. ALT. - IN.	APPROX. ALT. - IN.	APPROX. ALT. - IN.
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000
000	000	000	000	000	000	000	000

NOTES: ALL ROCKET POPS EMPTY
SCREEN SHIELDS REMOVE BOTH ON
2.500 SHIELDS REMOVE SCAS OFF

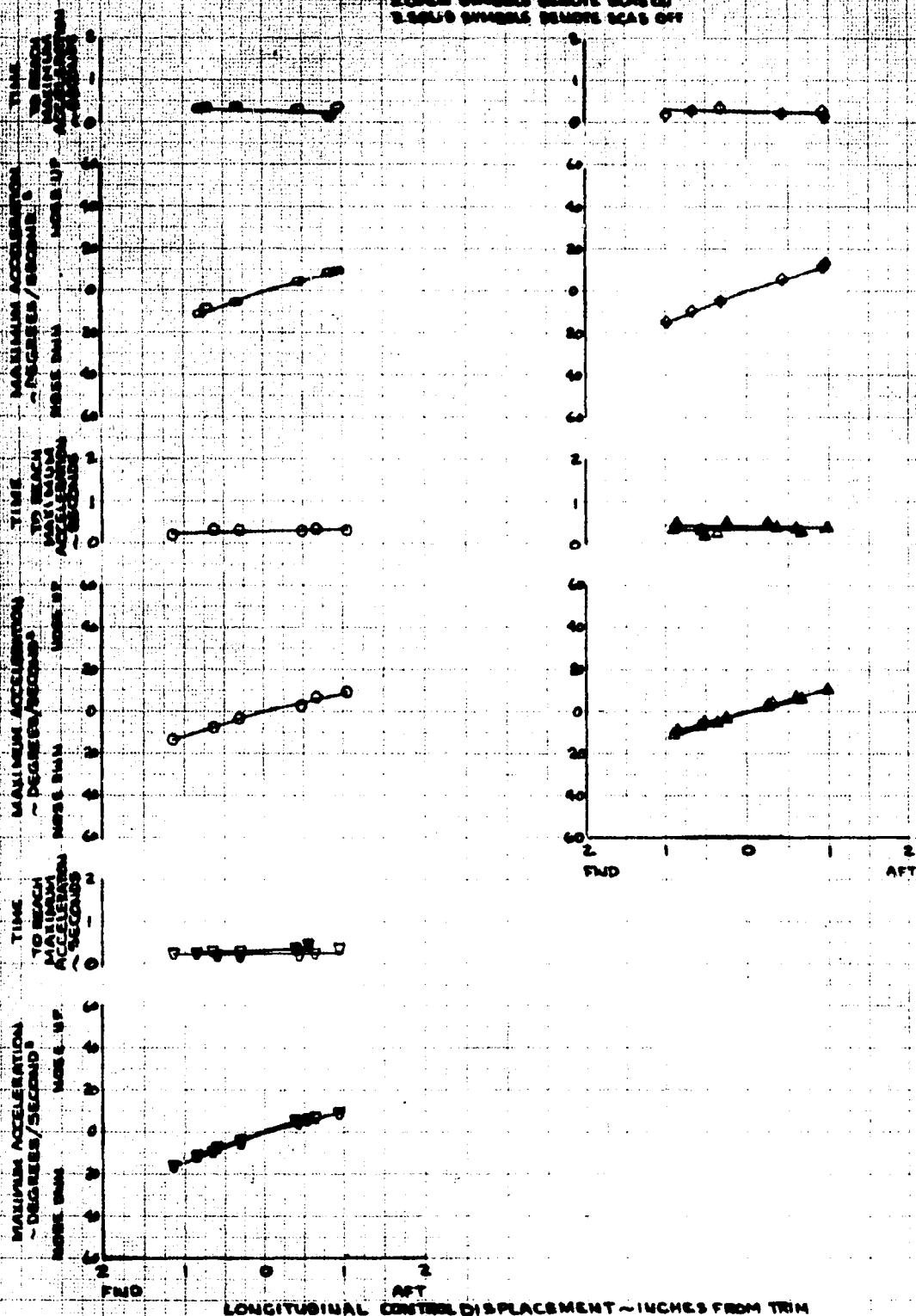


FIGURE NO 185
LONGITUDINAL CONTROL RESPONSE

AM-10 USAF 715695
HVV HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIRSPD ~CAS	AVG ALT ~FT.	AVG GW ~FT.	AVG LONG C.G. ~IN.	ROTOR FLIGHT CONDITION RPM	THRUST COEFF ~G _t
000	65.5	4340	9660	199.9 (AFT)	324.0 LEVEL FLIGHT	0.00 5457
000	108.0	5240	9440	200.0 (AFT)	324.0 LEVEL FLIGHT	0.00 5488
000	134.5	6590	9090	200.1 (AFT)	324.0 LEVEL FLIGHT	0.00 5496
000	172.0	7890	9600	199.7 (AFT)	324.0 DIVE	0.00 6044
000	61.0	3260	9660	199.7 (AFT)	324.0 CLIMB	0.00 5281

NOTE: ALL ROCKET PODS LOADED (1634 LB)

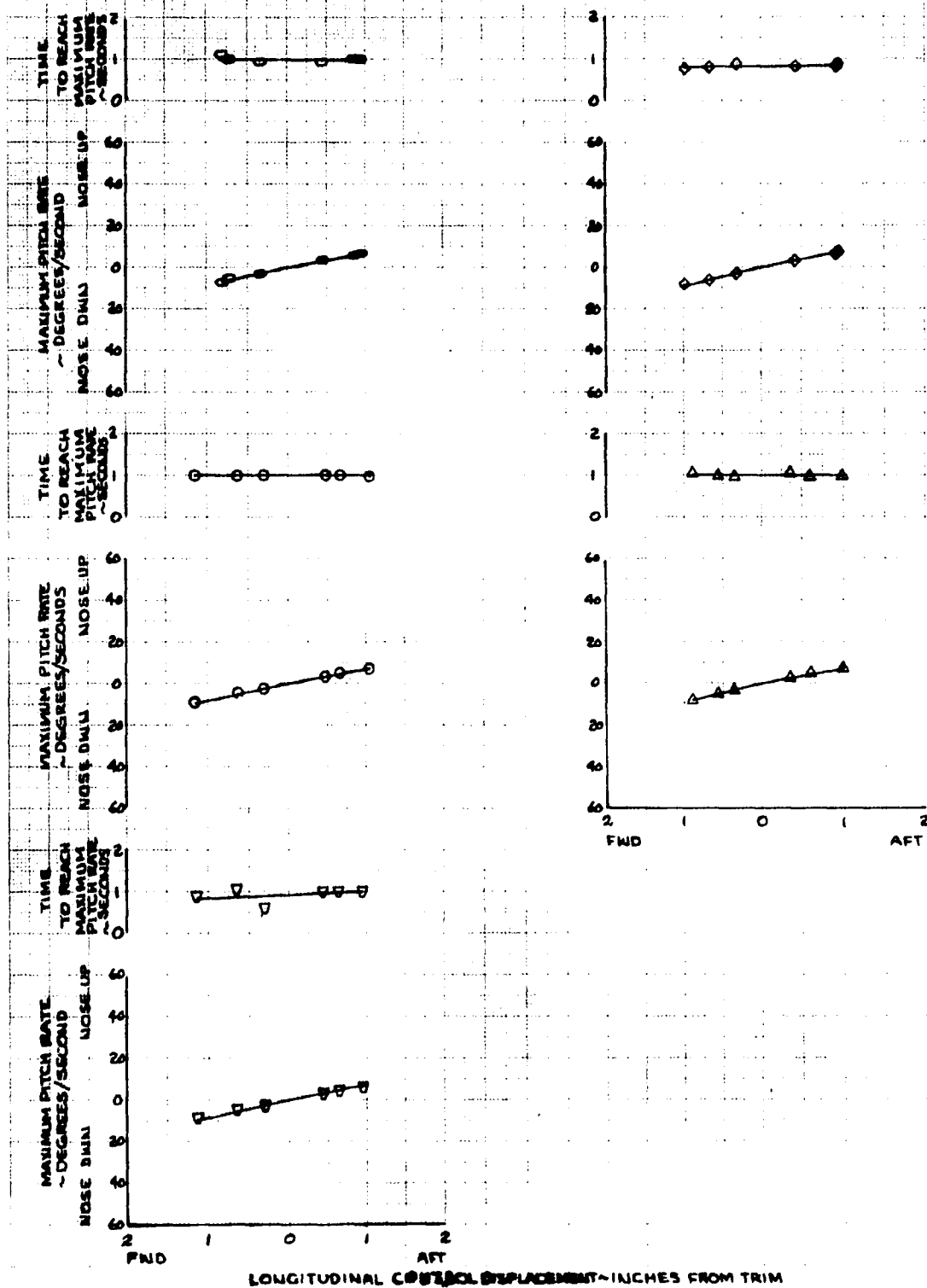


FIGURE No 186
LONGITUDINAL RESPONSE AT ONE SECOND

AH-1G USAF 15545
HVV HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	AVG. ALT. H ₀ ~ FT	AVG. G.M. ~ CG	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C _T
○	65.5	4240	9440	199.0 (H)	3240	LEVEL FLIGHT	0.005457
○	100.0	3240	9440	200.0 (H)	3240	LEVEL FLIGHT	0.005458
○	124.5	6580	9090	200.1 (AFT)	3240	LEVEL FLIGHT	0.005496
○	172.0	7890	8680	199.7 (AFT)	3240	DIVE	0.005044
△	61.0	3250	8640	199.7 (AFT)	3240	CLIMB	0.005281

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB.)

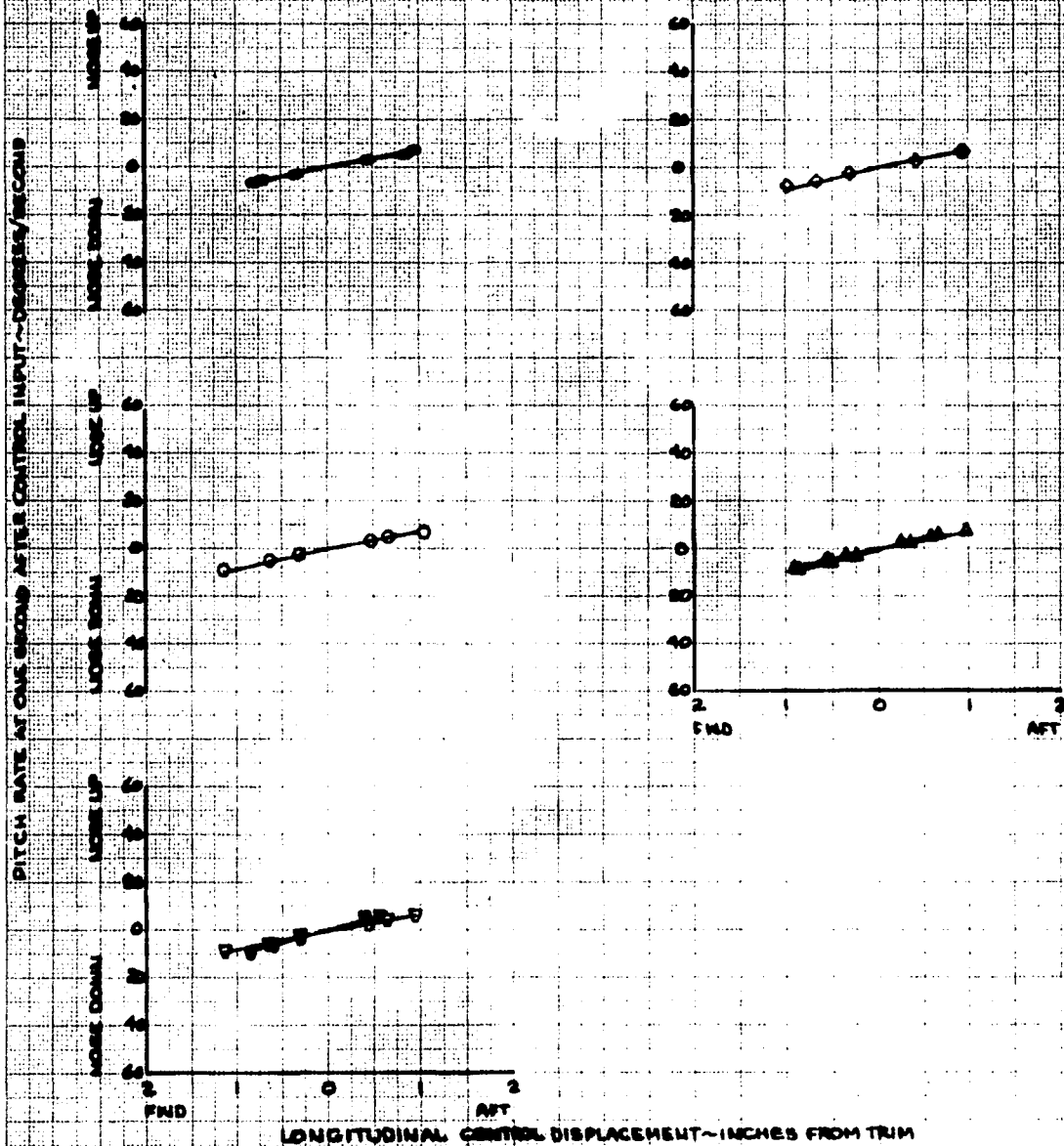


FIGURE NO 187
ANGULAR PITCH DISPLACEMENT
AM-16 USAF 718478

HVY. NOG CONFIGURATION WITH ROCKET PDS FAIRINGS REMOVED

SYM	AIRSPER ~ CAS	AVE. ALT ~ Ft	AVE. DM ~ LB	AVE. LONG CG ~ IN	WTS ~ LB	FLY COND	THRUST COND
1	1000	1000	1000	1000	1000	LEVEL	ON
2	1000	1000	1000	1000	1000	CLIMB	ON
3	1000	1000	1000	1000	1000	CLIMB	ON
4	1000	1000	1000	1000	1000	CLIMB	ON
5	1000	1000	1000	1000	1000	CLIMB	ON
6	1000	1000	1000	1000	1000	CLIMB	ON
7	1000	1000	1000	1000	1000	CLIMB	ON
8	1000	1000	1000	1000	1000	CLIMB	ON
9	1000	1000	1000	1000	1000	CLIMB	ON
10	1000	1000	1000	1000	1000	CLIMB	ON

DOTTED LINE SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS FULLY LOADED (4500 LB)

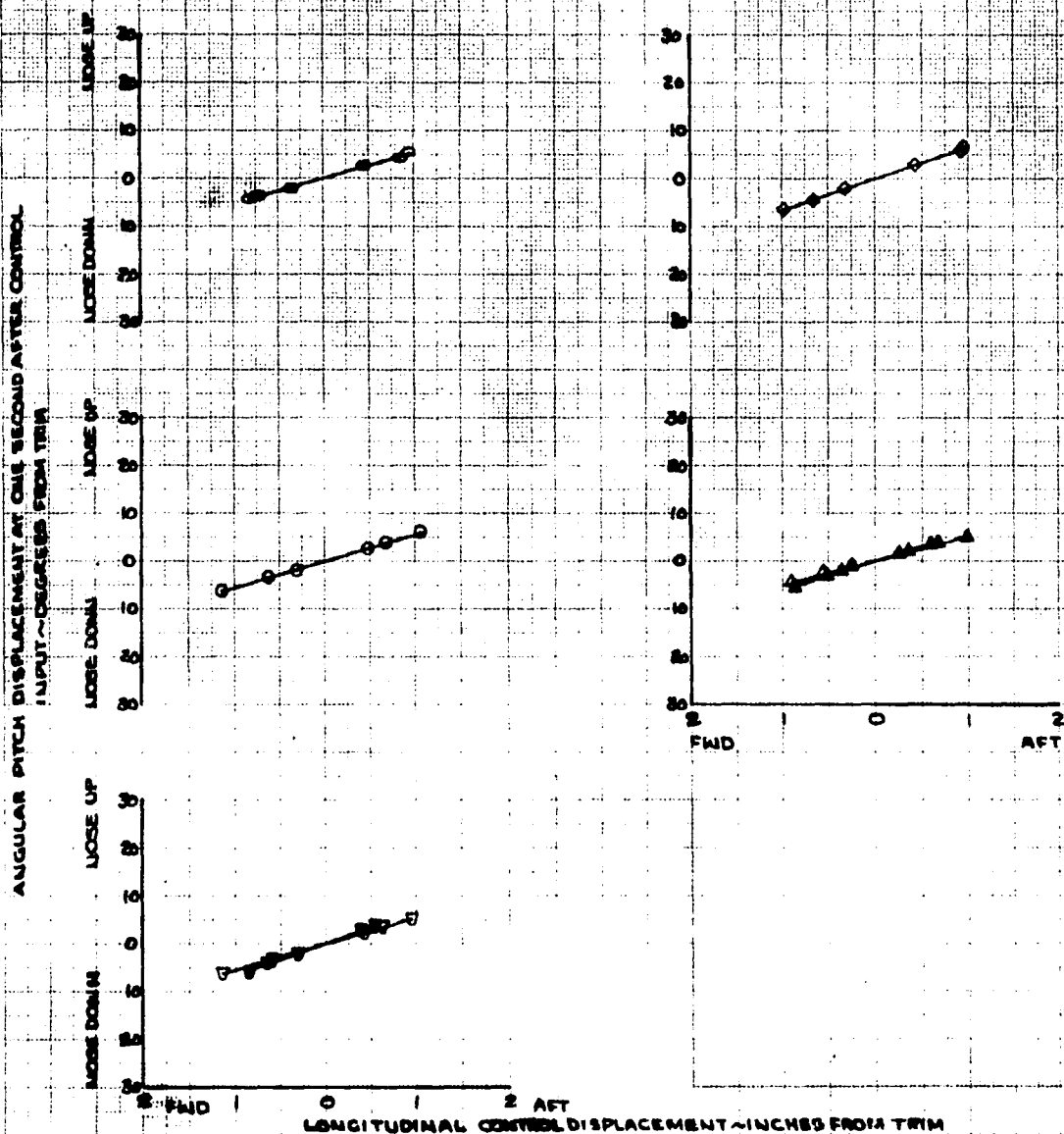


FIGURE NO. 185
LONGITUDINAL CONTROL SENSITIVITY
 AH-1G USAF 715678

HVV HOS CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~KTS	AVE ALT H ₀ ~FT	AVE S-H ~LB	AVE LONG C.G. ~IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C _T
0	55.0	15350	7970	200.9(40)	3240	LEVEL FLIGHT	0.006370
1	55.0	15420	7970	200.9(40)	3240	LEVEL FLIGHT	0.006370
2	101.0	15440	7850	200.9(40)	3240	LEVEL FLIGHT	0.006370

MORE DENSE SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF
 ALL ROCKET PODS EMPTY

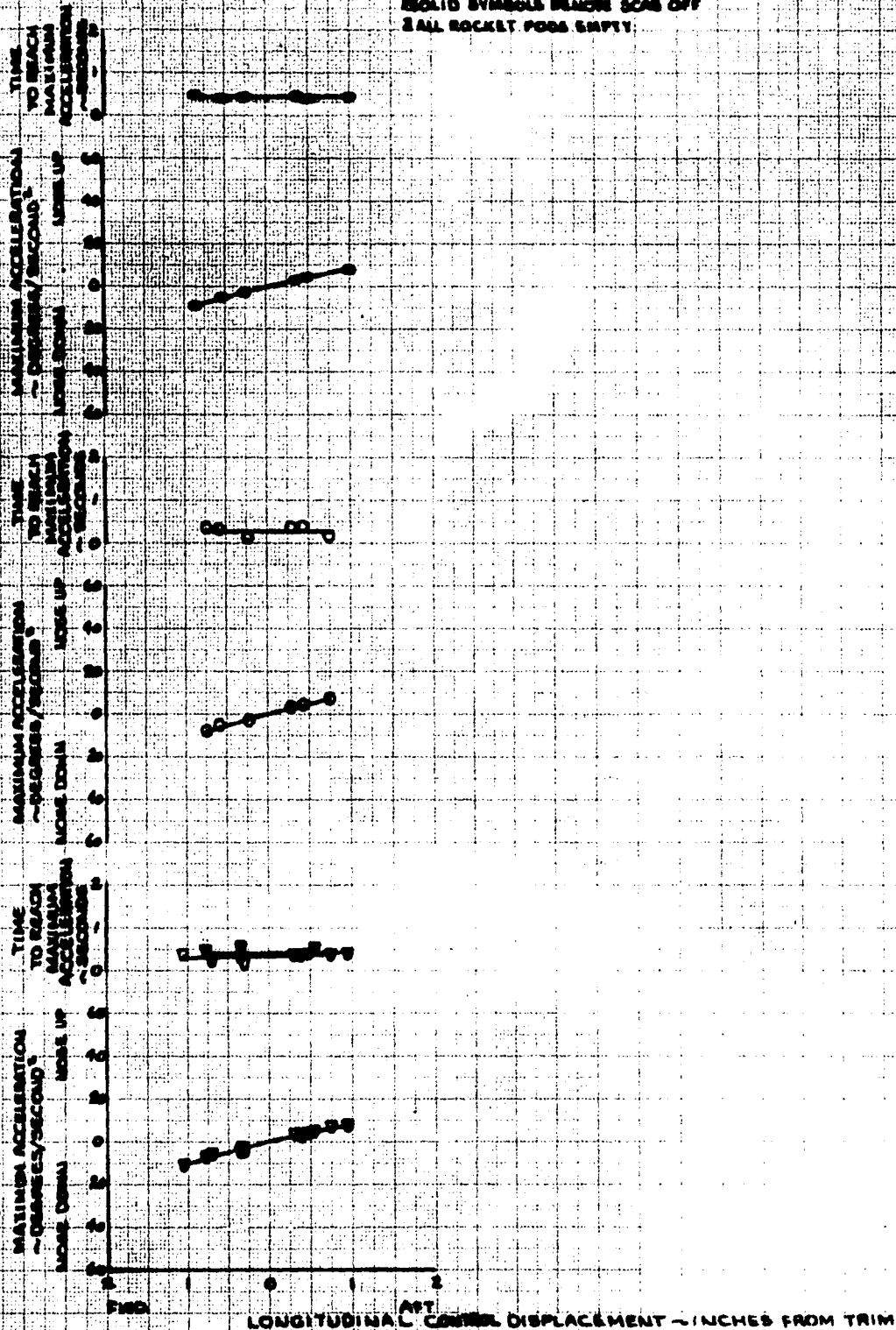


FIGURE No. 169 LONGITUDINAL CONTROL RESPONSE

AM-1B USAF 115649

MYX HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SCAS ON

SEA	APPROX	Avg. ALT	Avg. S.A.	Avg. MACH	POWER PLANT	FUNCTION	THRUST COEFF.
8	15.5	18,725	7770	0.82	22,000	SEAS LEVEL FLIGHT	0.006810
9	105.0	18,470	7850	0.82	22,000	SEAS LEVEL FLIGHT	0.006895

NOTE: ALL SPEEDS FROM 0.82 MACH

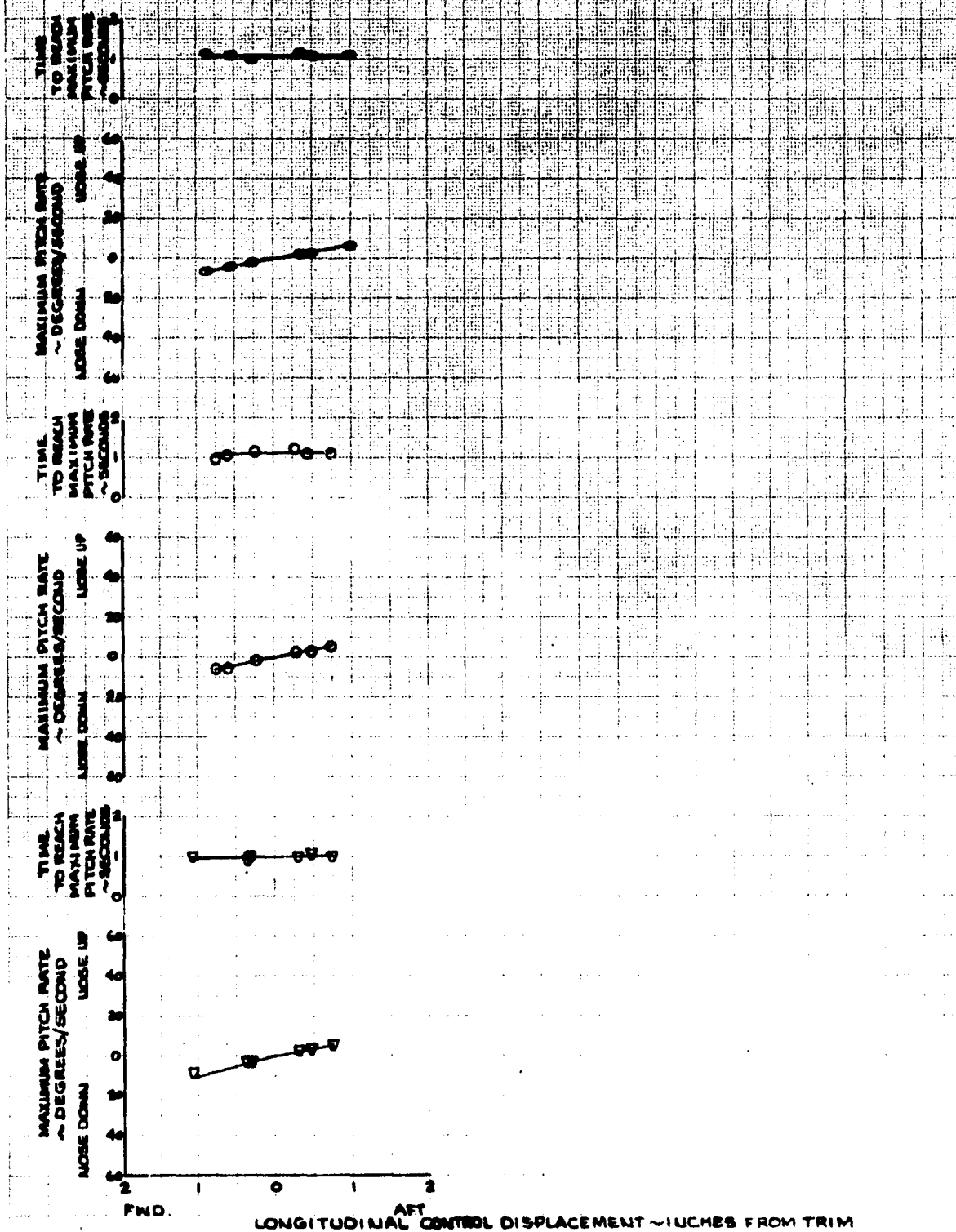


FIGURE 12-190
LONGITUDINAL RESPONSE AT ONE SECOND
AT 10,000 FEET

HYDRODYNAMIC COEFFICIENTS AND MOMENTS DERIVED FROM

REF	WING AREA	WING SPAN	WING CHORD	WING AREA	WING SPAN	WING CHORD	WING AREA	WING SPAN	WING CHORD
1	1000	1000	1000	1000	1000	1000	1000	1000	1000
2	1000	1000	1000	1000	1000	1000	1000	1000	1000
3	1000	1000	1000	1000	1000	1000	1000	1000	1000
4	1000	1000	1000	1000	1000	1000	1000	1000	1000
5	1000	1000	1000	1000	1000	1000	1000	1000	1000
6	1000	1000	1000	1000	1000	1000	1000	1000	1000
7	1000	1000	1000	1000	1000	1000	1000	1000	1000
8	1000	1000	1000	1000	1000	1000	1000	1000	1000
9	1000	1000	1000	1000	1000	1000	1000	1000	1000
10	1000	1000	1000	1000	1000	1000	1000	1000	1000

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF
 ALL ROCKET PODS EMPTY

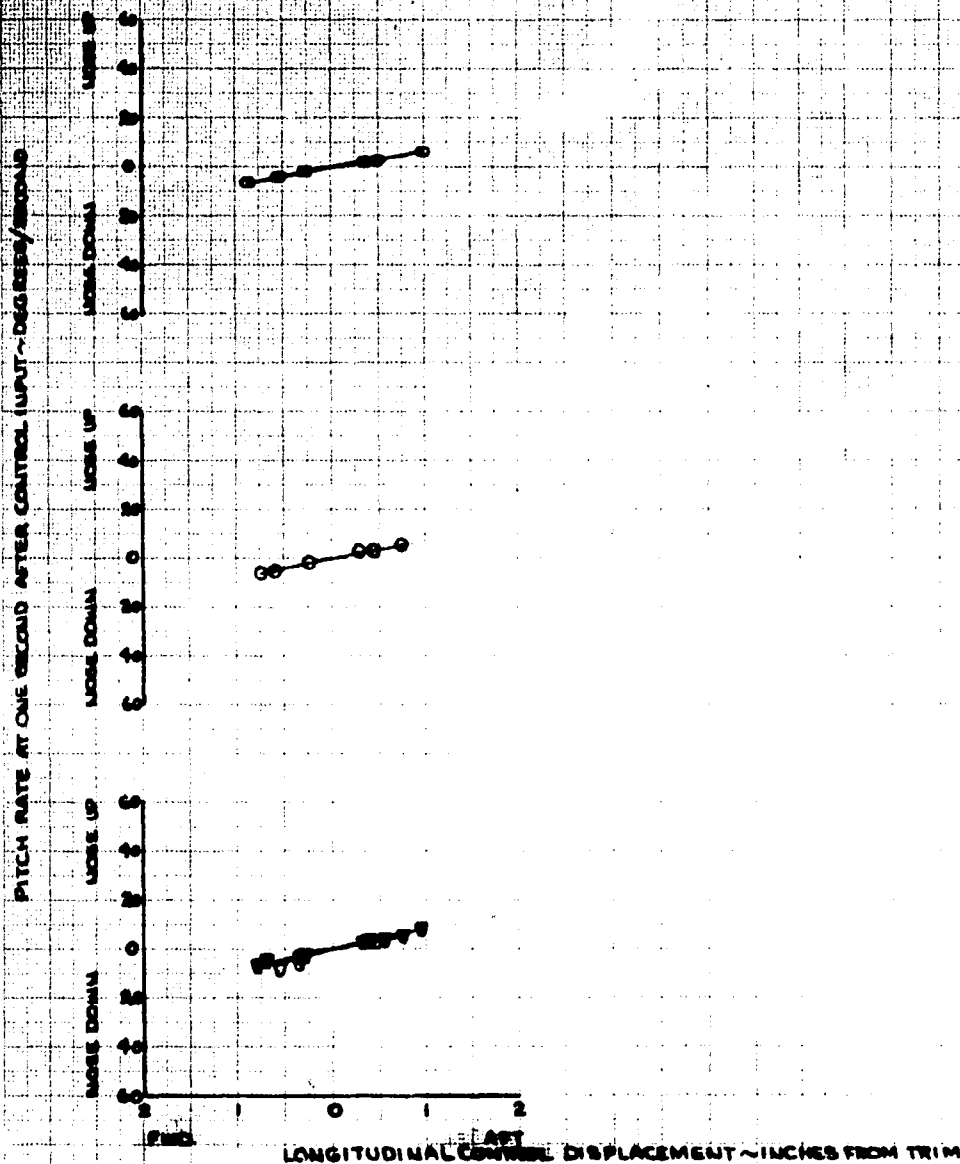


FIGURE NO. 191
ANGULAR PITCH DISPLACEMENT
AN-10 USAF 715075

NAV. POS. CONFIGURATION WITH ROCKET POD PAIRINGS REMOVED

SYM	ALTITUDE ~ FEET	ALT ~ FEET	Avg. C.M. ~ IN.	Avg. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT POSITION	THRUST ~ CT
00	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
01	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
02	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
03	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
04	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
05	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
06	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
07	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
08	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
09	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
10	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
11	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
12	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
13	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
14	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
15	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
16	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
17	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
18	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
19	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310
20	1000	1000	1110	100 (AFT)	1150	LEVEL FLIGHT	0.006310

NOTES: OPEN CIRCLES DENOTE SCAS ON
 SOLID CIRCLES DENOTE SCAS OFF
 BALL ROCKET PODS EMPTY

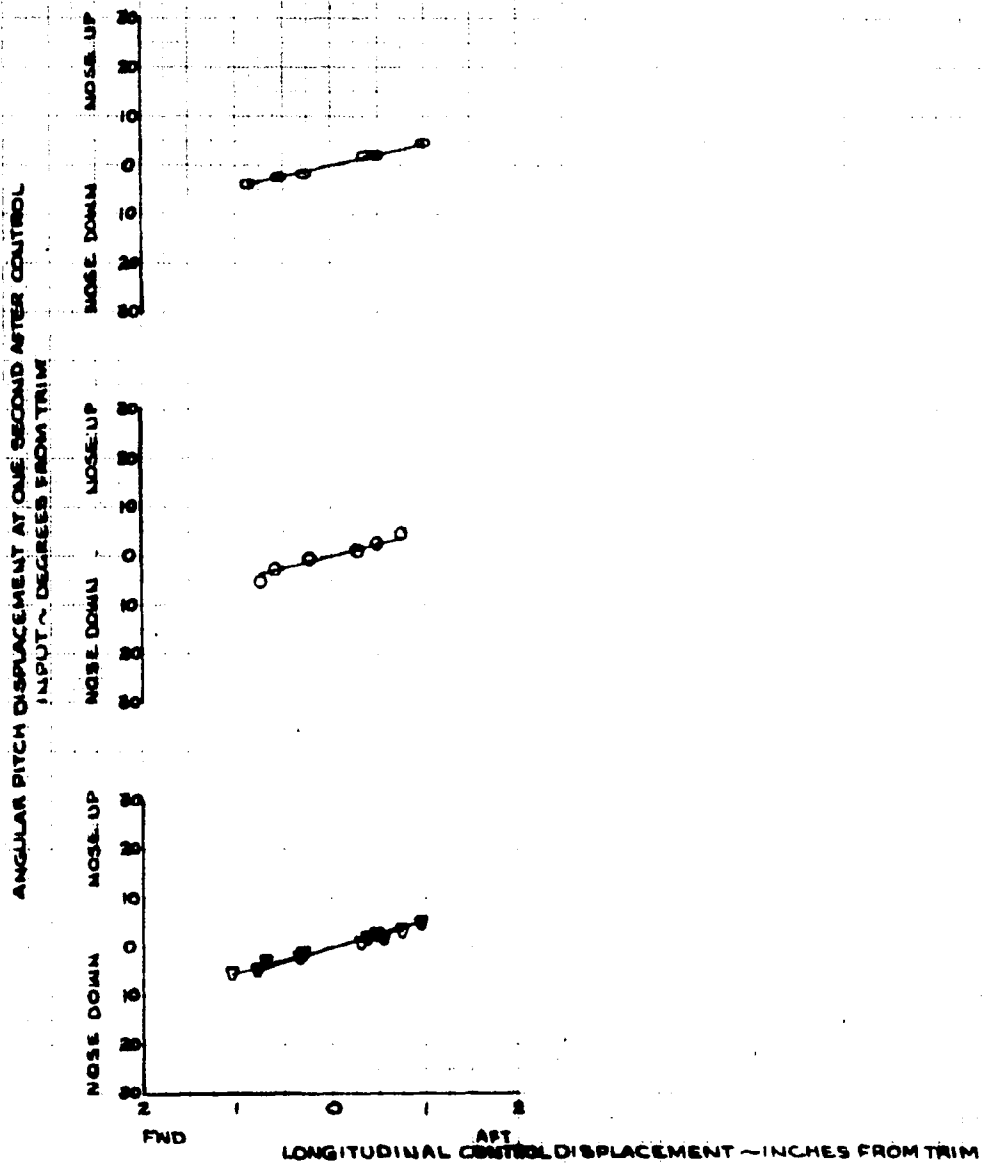


FIGURE NO. 1R2
LATERAL CONTROL SENSITIVITY
 AH-1G USAF/15678
 CLEAN CONFIGURATION

SYM	AIRSPED ~KTS	AVG ALT ~FT	AVG G.H. ~LB	AVG LENS C.G.~IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEF.
○	65.0	4970	7710	201.2 (AFT)	3240	LEVEL FLIGHT	0.004439
○	104.0	6790	7300	201.1 (AFT)	3240	LEVEL FLIGHT	0.004443
◇	145.0	4960	7460	201.2 (AFT)	3240	LEVEL FLIGHT	0.004820
◇	181.0	3140	7700	201.2 (AFT)	3240	DIVE	0.004189
△	62.0	2440	7620	201.2 (AFT)	3240	CLIMB	0.004066
□	68.5	2290	7730	201.2 (AFT)	3000	AUTOROTATION	0.004435

NOTE : OPEN SYMBOLS DENOTE SCALON
 SOLID SYMBOLS DENOTE SCALOFF

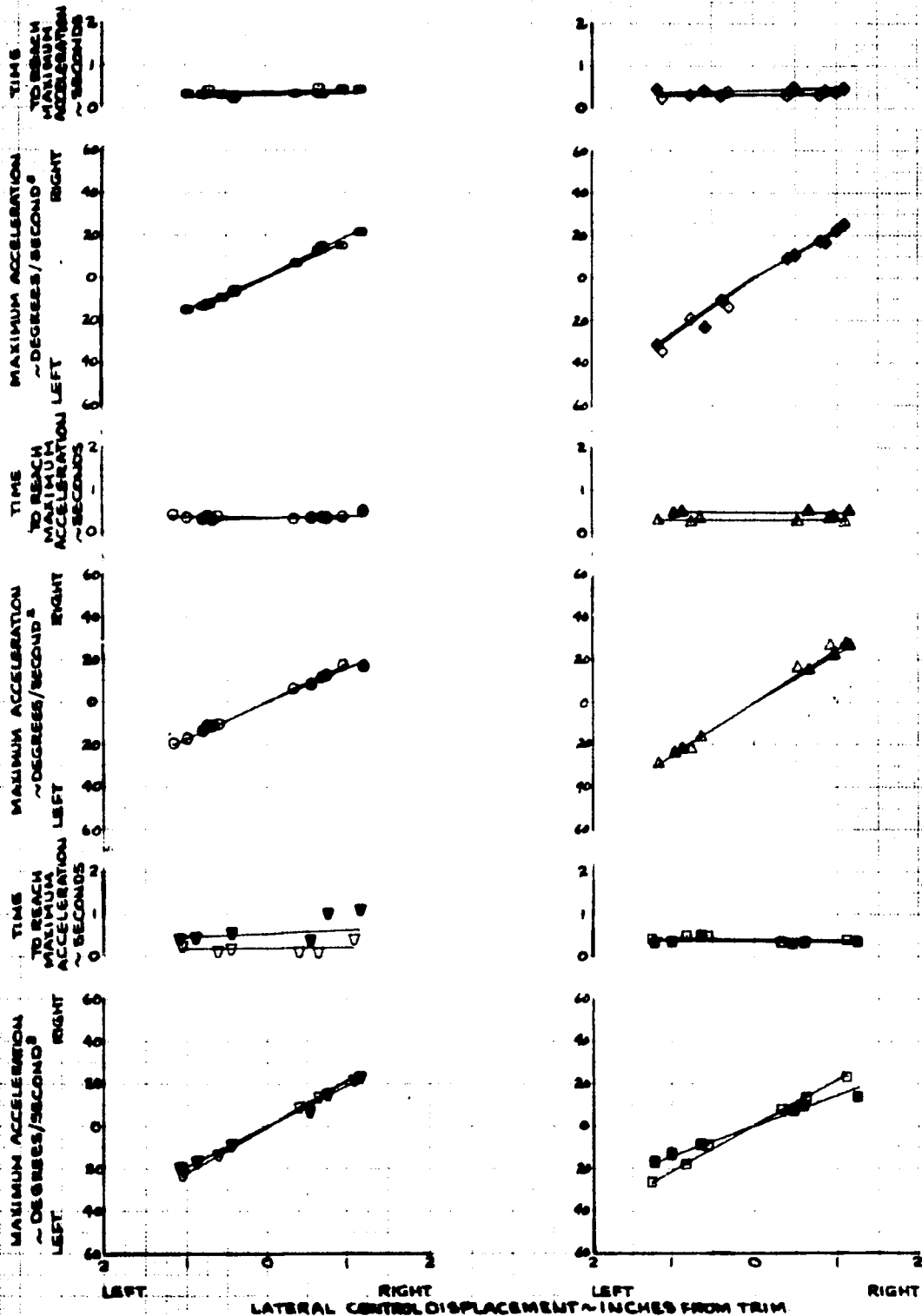


FIGURE No. 193
LATERAL CONTROL RESPONSE
 AH-1G USA 6715698
 CLEAN CONFIGURATION
 SCAS ON

SYM	AIR SPEED ~CAS	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. CG ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF.
000000	68.0	4470	7710	201.2 (AFT)	3240	LEVEL FLIGHT	0.004439
	104.0	6140	7800	201.1 (AFT)	3240	LEVEL FLIGHT	0.004443
	148.0	4960	7460	201.2 (AFT)	3340	LEVEL FLIGHT	0.004820
	181.0	8140	7700	201.2 (AFT)	3340	DIVE	0.004183
	22.0	2460	7620	201.2 (AFT)	3340	CLIMB	0.004064
000000	68.0	3240	7750	201.2 (AFT)	3000	AUTOROTATION	0.004433

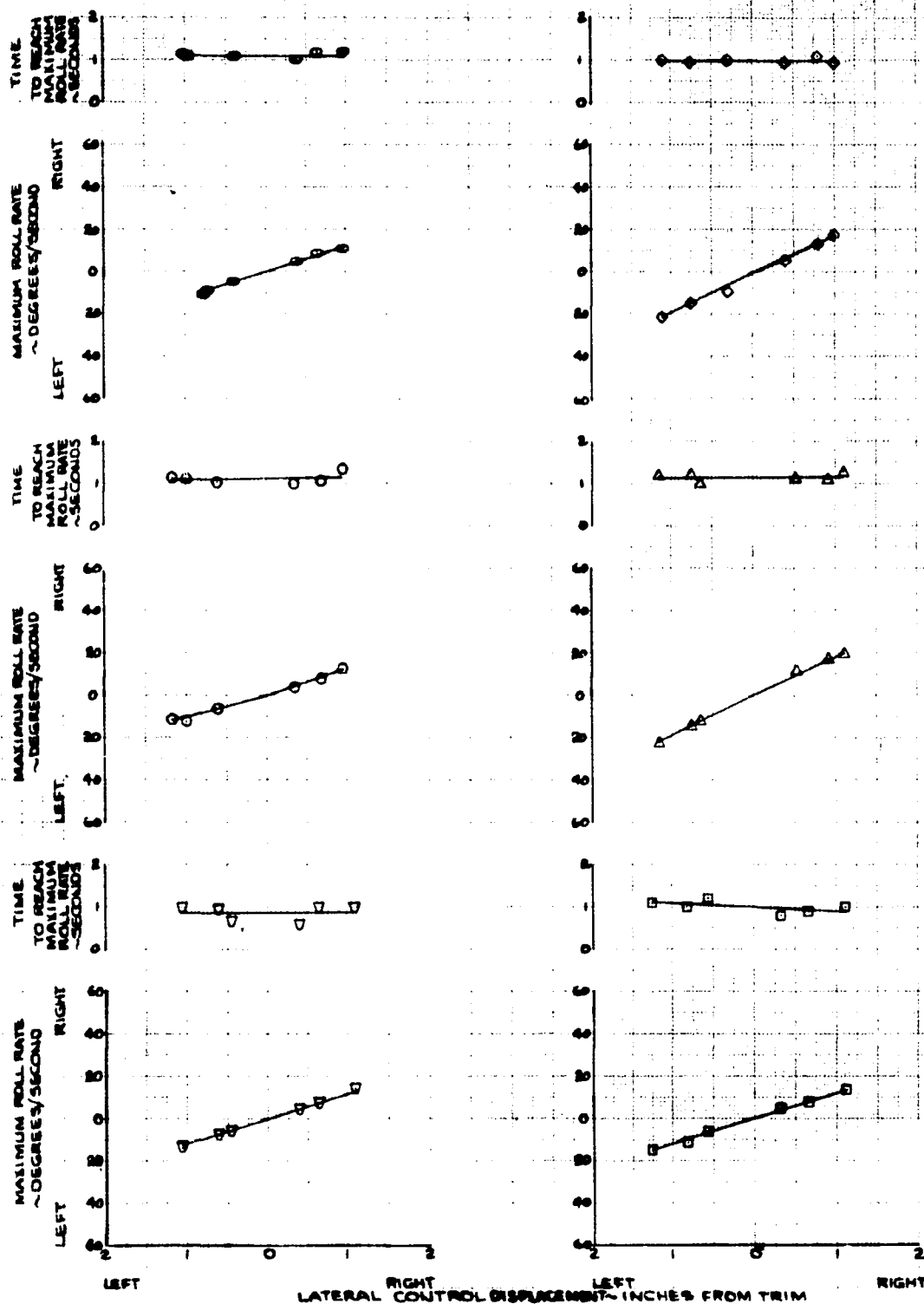


FIGURE NO. 194
LATERAL RESPONSE AT ONE SECOND
 -AH-1G USAF/USMC
 CLEAN CONFIGURATION

SYM	AIR SPEED ~KAS	AVG. ALT. ~FT	AVG. G.W. ~LB	AVG. LONG. C.G. ~IN.	MOTOR RPM	FLIGHT CONDITION	ROLL RATE ~CT
00	62.0	4970	7710	201.2 (AFT)	3240	LEVEL FLIGHT	0.004094
00	104.0	6790	7300	201.1 (AFT)	3240	LEVEL FLIGHT	0.004443
00	146.0	4960	1460	201.2 (AFT)	3240	LEVEL FLIGHT	0.004830
00	181.0	3140	7100	201.2 (AFT)	3240	DIVE	0.004183
00	62.0	2640	7630	201.2 (AFT)	3240	CLIMB	0.004066
00	68.5	2290	7730	201.2 (AFT)	3000	AUTOROTATION	0.004635

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF

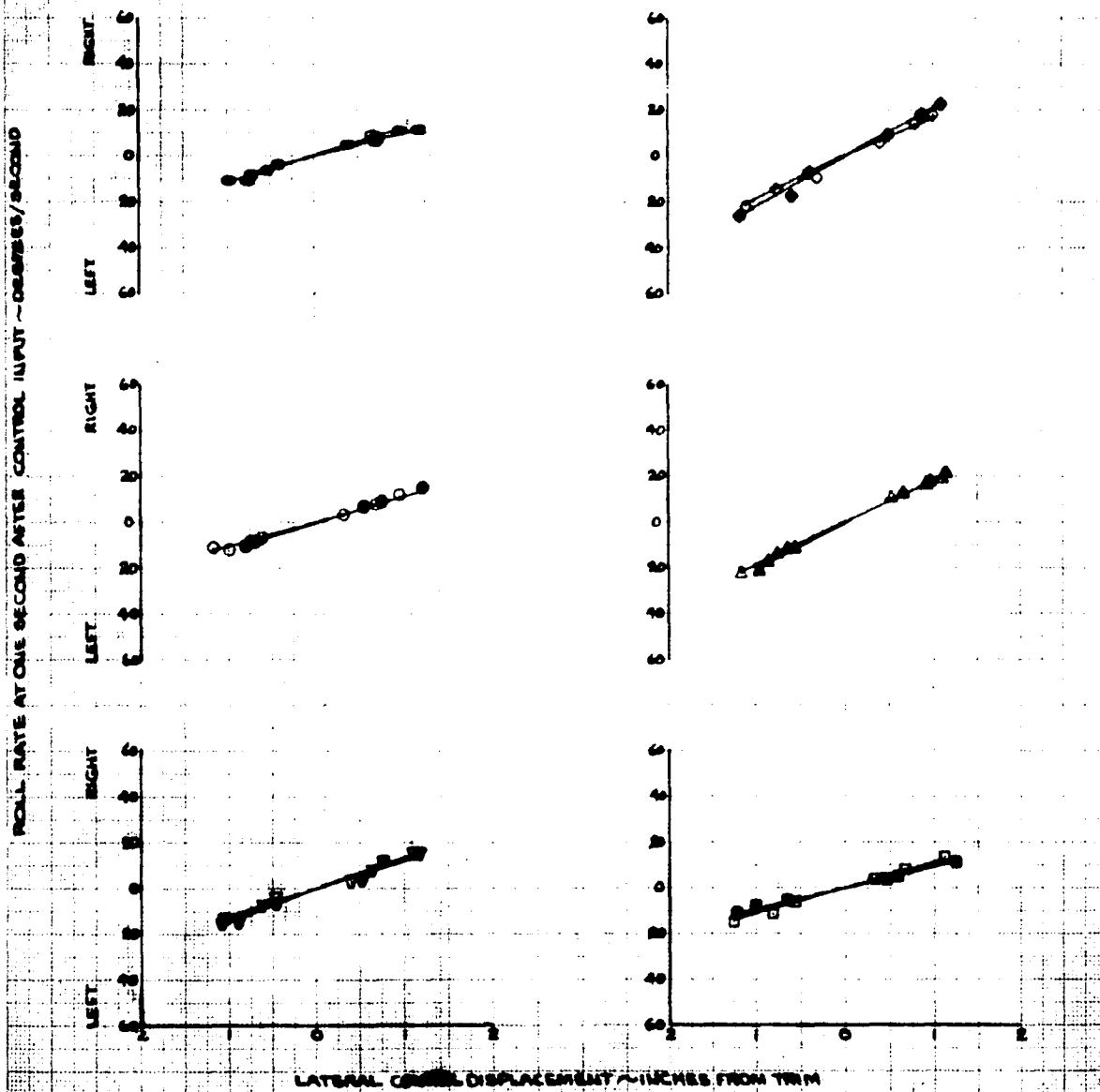


FIGURE NO. 195
ANGULAR ROLL DISPLACEMENT
 AH-1G USAF/USMC
 CLEAN CONFIGURATION

SYM.	AIR SPEED ~ CAS	AVG. ALT. ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR FLIGHT CONDITION RPM	THRUST COEFF. ~ C _T
000	65.0	4970	7710	201.2 (AF)	3240 LEVEL FLIGHT	0.004434
000	109.0	6190	7500	201.1 (AF)	3240 LEVEL FLIGHT	0.004443
000	143.0	4960	7460	201.2 (AF)	3240 LEVEL FLIGHT	0.004830
000	181.0	3140	7700	201.2 (AF)	3240 DIVE	0.004187
000	62.0	2440	7680	201.2 (AF)	3240 CLIMB	0.004066
000	68.3	3290	7750	201.2 (AF)	3080 AUTOROTATION	0.004125

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF

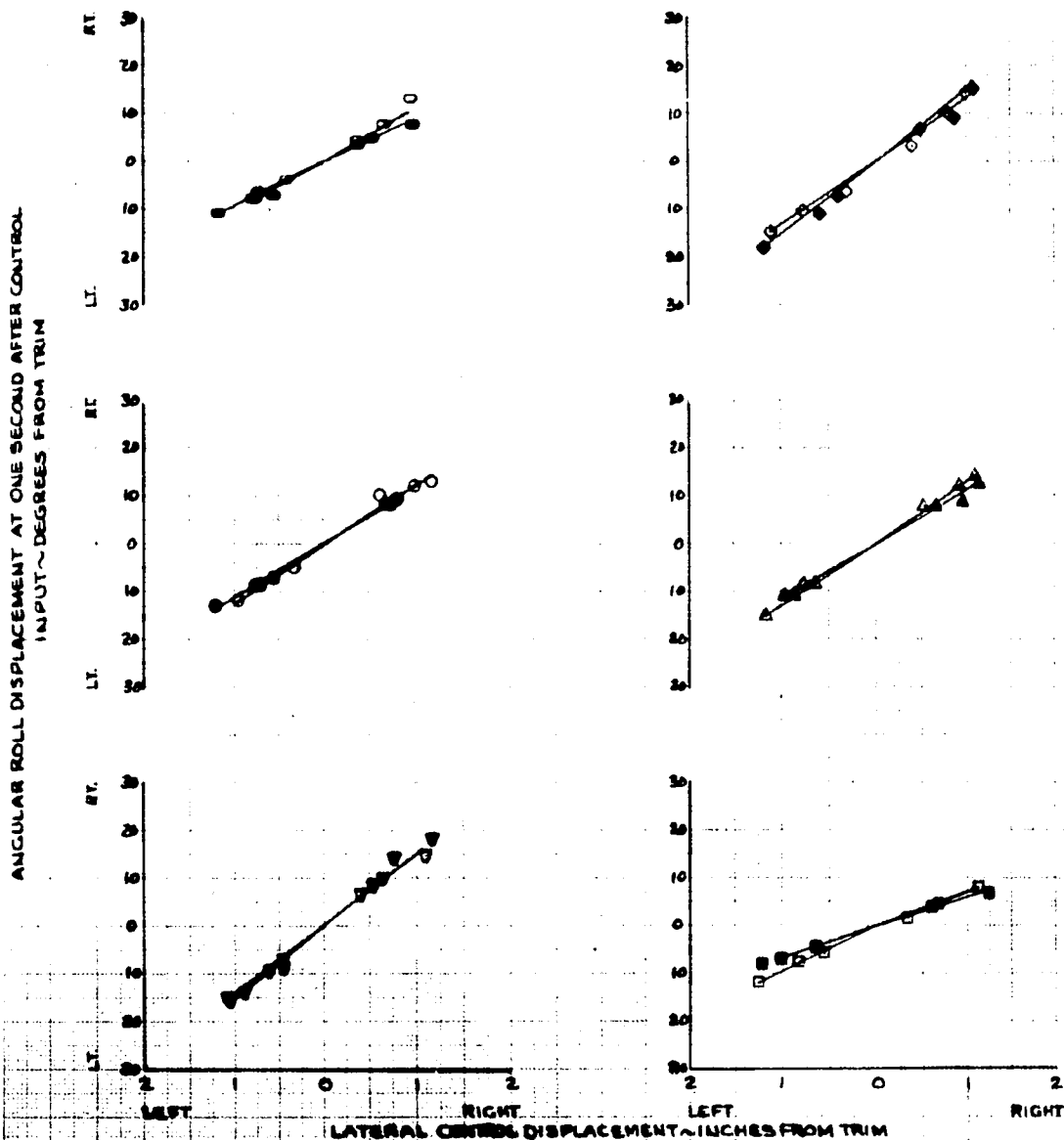


FIGURE NO. 196
LATERAL CONTROL SENSITIVITY

AH-1G USA 824887

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TIE BARRING REMOVED
SEAS ON

WTH	AIR SPEED ~ CAS	AVG. ALT. H ₀ ~ FT.	AVG. CH. ~ LB	AVG. LONG. C.G. ~ IN.	MODE	FLIGHT COND	THRUST COEFF. ~ CT
0	116.0	3260	8800	149.6 (AFT)	8800	LEVEL FLIGHT	0.004899
0	145.5	3760	8480	149.8 (AFT)	8800	LEVEL FLIGHT	0.004867
0	169.0	5090	8870	149.4 (AFT)	8825	DIVE	0.004881

TIME
TO REACH
MAXIMUM
ACCELERATION
~ SEC.

MAXIMUM ACCELERATION
~ DEGREES/SECOND

FLIGHT CONDITION FOR MINIMUM
ENGINE POWER REQUIRED NOT
FLOWN

TIME
TO REACH
MAXIMUM
ACCELERATION
~ SEC.

MAXIMUM ACCELERATION
~ DEGREES/SECOND

TIME
TO REACH
MAXIMUM
ACCELERATION
~ SEC.

MAXIMUM ACCELERATION
~ DEGREES/SECOND

FLIGHT CONDITION FOR MAXIMUM
RATE OF CLIMB NOT FLOWN

FLIGHT CONDITION FOR MAXIMUM RATE
OF DESCENT IN AUTOROTATION
NOT FLOWN

LEFT

LEFT

RIGHT

LATERAL ENGINE DISPLACEMENT ~ INCHES FROM TRIM

FIGURE No 197 LATERAL CONTROL RESPONSE

AH-1B USA 6418047

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED
6 CAS ON

SYM	AIR SPEED ~CAS	AVG. ALT. ~FT.	AVG. G.M. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
0	115.0	8760	8880	199.6 (AFT)	3230	LEVEL FLIGHT	0.004899
0	145.5	8760	8680	199.5 (AFT)	3230	LEVEL FLIGHT	0.004847
0	169.0	8690	8570	199.4 (AFT)	3225	DIVE	0.004881

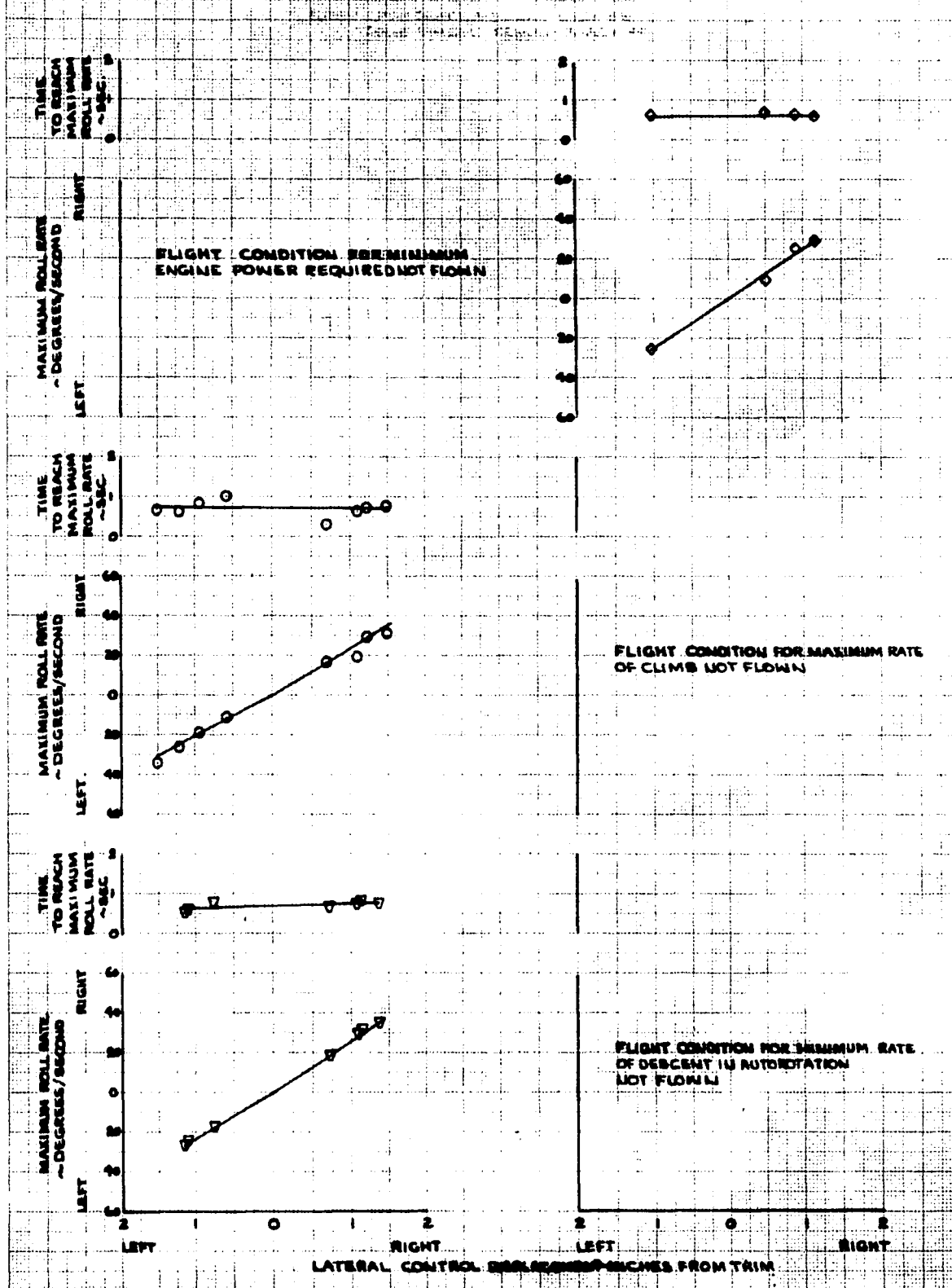


FIGURE NO. 198
LATERAL RESPONSE AT ONE SECOND

AH-1G USA 4188861
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED
SCAS ON

SYM	AIR SPEED ~CAS	AVG. ALT. H ₀ ~FT.	AVG. G.M. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
0	116.0	3860	8880	199.6(AFT)	3230	LEVEL FLIGHT	0.004899
0	145.5	3760	8680	199.6(AFT)	3230	LEVEL FLIGHT	0.004847
0	169.0	3090	8370	199.4(AFT)	3225	DIVE	0.004881

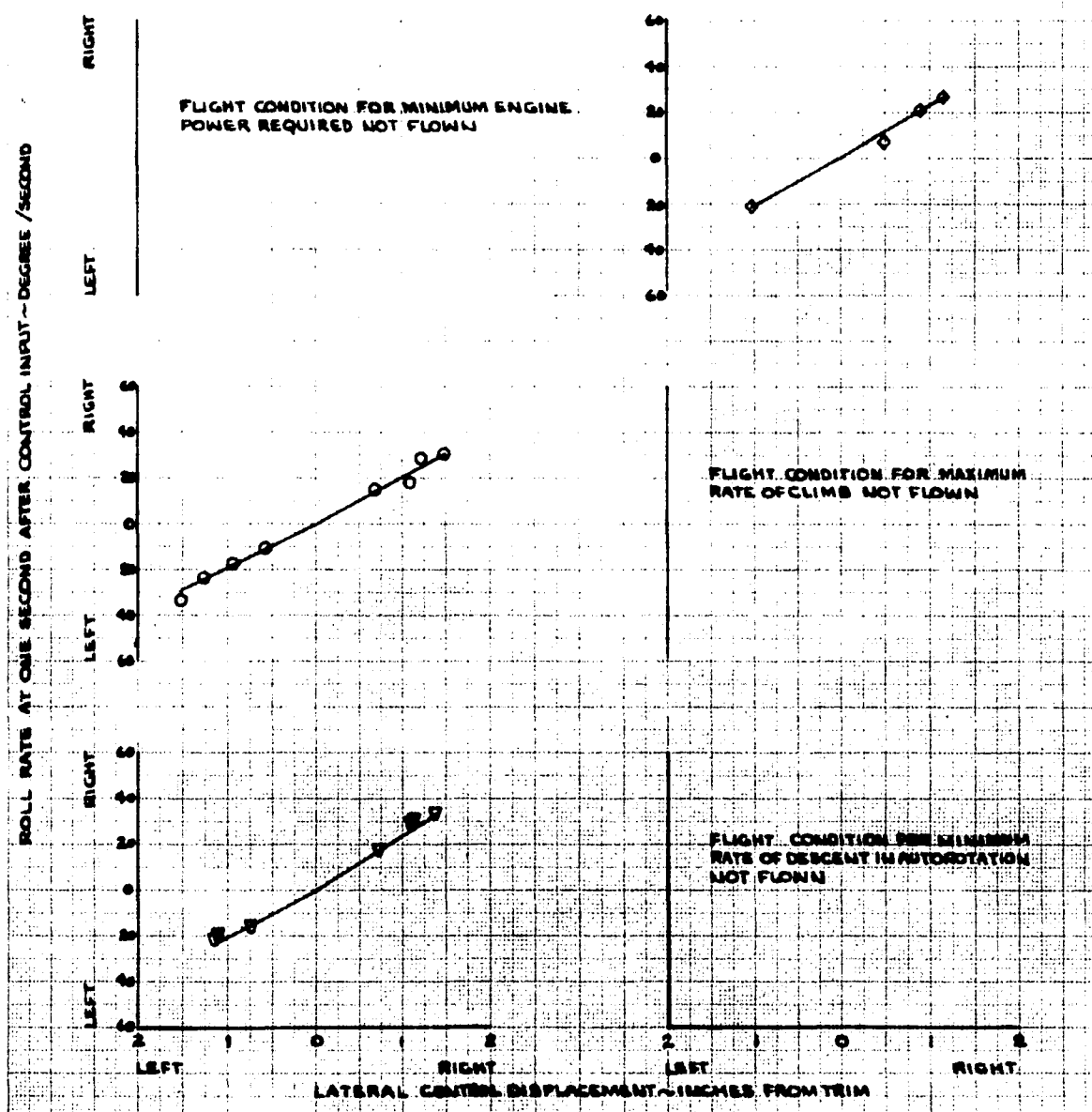


Figure No. 199
ANGULAR ROLL DISPLACEMENT

AH-1G USAF 800
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED
SCAS ON

SYM	AIR SPEED ~KAS	AVG. ALT. ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
0	116.0	8360	8880	199.6(AFT)	3230	LEVEL FLIGHT	0.004899
0	146.5	8760	8680	199.6(AFT)	3230	LEVEL FLIGHT	0.004847
0	169.0	5090	8570	199.4(AFT)	322.5	DIVE	0.004861

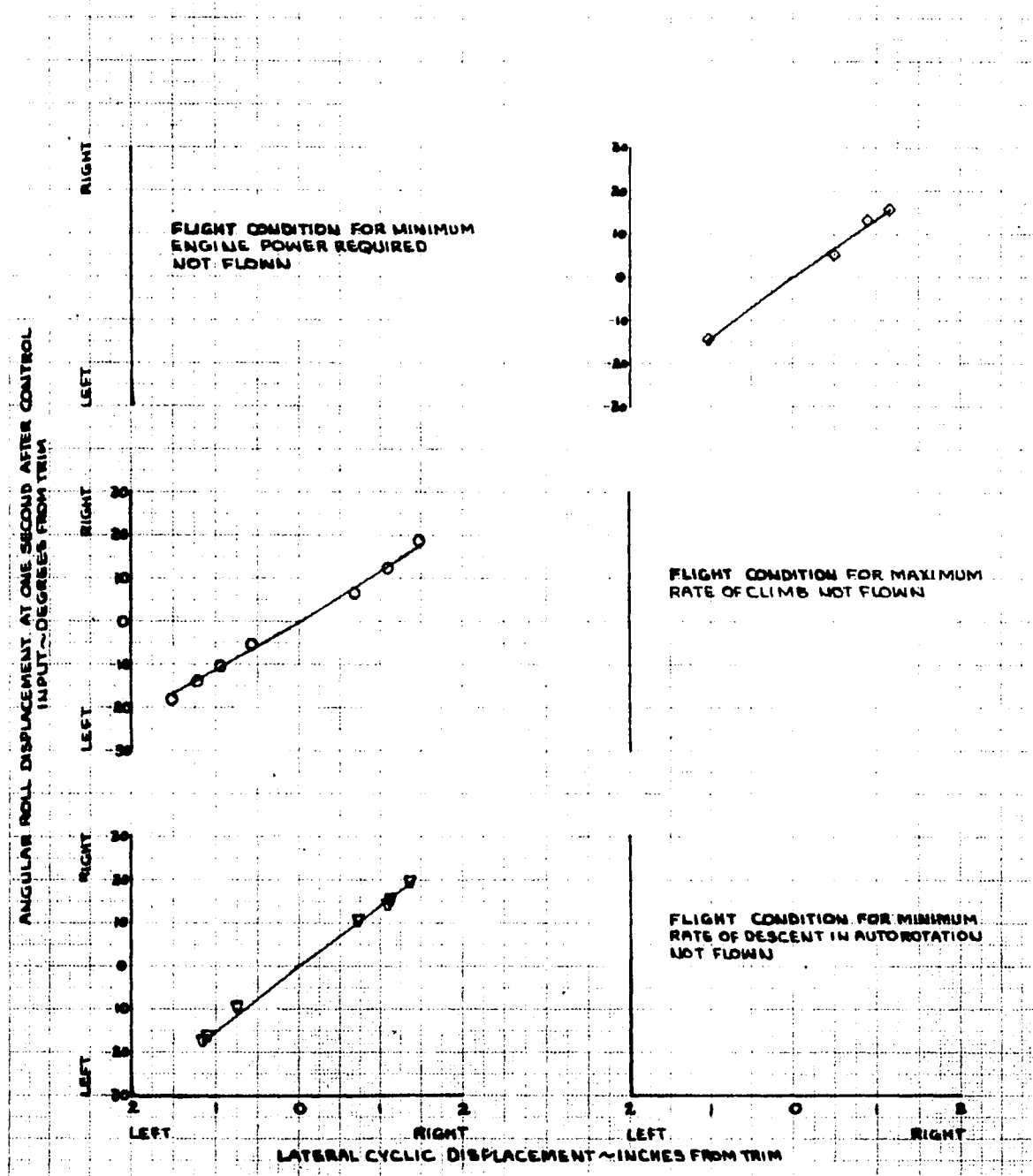


FIGURE NO. 200 LATERAL CONTROL SENSITIVITY

AM-1G USAF 718698
MVV SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

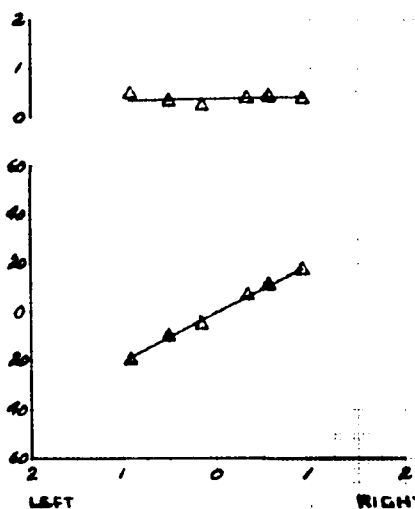
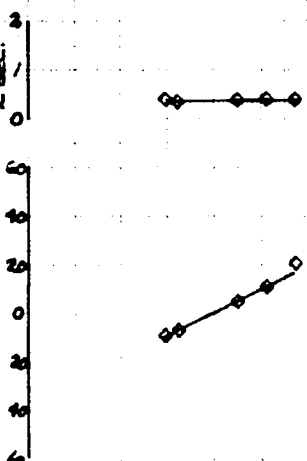
SYM	AIR SPEED ~CAS	AVG. ALT. ~FT	AVG. SW. ~LB.	AVG. LONG. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C _T
0	108.0	8770	9070	200.3(AFT)	8240	LEVEL FLIGHT	0.008350
0	148.0	5490	9240	200.3(AFT)	8240	LEVEL FLIGHT	0.008404
0	172.0	6310	9440	200.0(AFT)	8240	DIVE	0.005661
Δ	58.0	2870	9480	300.0(AFT)	8240	CLIMB	0.006124

NOTE: 811LB. IN OUTSD ROCKET PODS.

TIME
TO REACH
MAXIMUM
ACCELERATION
~SEC.

MAXIMUM ACCELERATION
~DEGREES/SECOND²

RIGHT
LEFT



TIME
TO REACH
MAXIMUM
ACCELERATION
~SECONDS

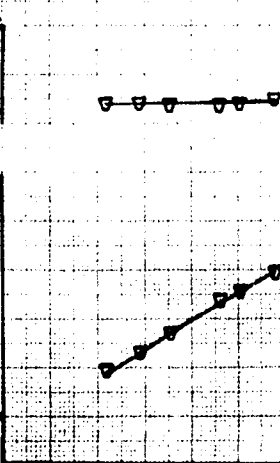
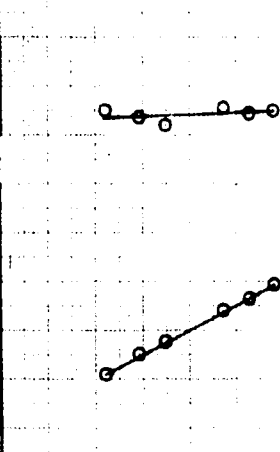
MAXIMUM ACCELERATION
~DEGREES/SECOND²

RIGHT
LEFT

TIME
TO REACH
MAXIMUM
ACCELERATION
~SECONDS

MAXIMUM ACCELERATION
~DEGREES/SECOND²

RIGHT
LEFT



LATERAL CONTROL DISPLACEMENT ~INCHES FROM TRIM

FIGURE NO. 201
LATERAL CONTROL RESPONSE
 AN-10 USAF 715685
 HYV. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
 SCAB ON

SYM	AIR SPEED ~KAS	AVG. ALT. H ₀ ~FT	AVG. G.M. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C _T
O	105.0	5770	9070	200.2(AFT)	3240	LEVEL FLIGHT	0.005350
□	143.0	5490	9240	200.2(AFT)	3240	LEVEL FLIGHT	0.005404
△	172.0	6310	9490	200.2(AFT)	3240	DIVE	0.005661
▲	88.0	2870	9680	200.0(AFT)	3240	CLIMB	0.005124

NOTE: 817 LB IN OUTER ROCKET POD

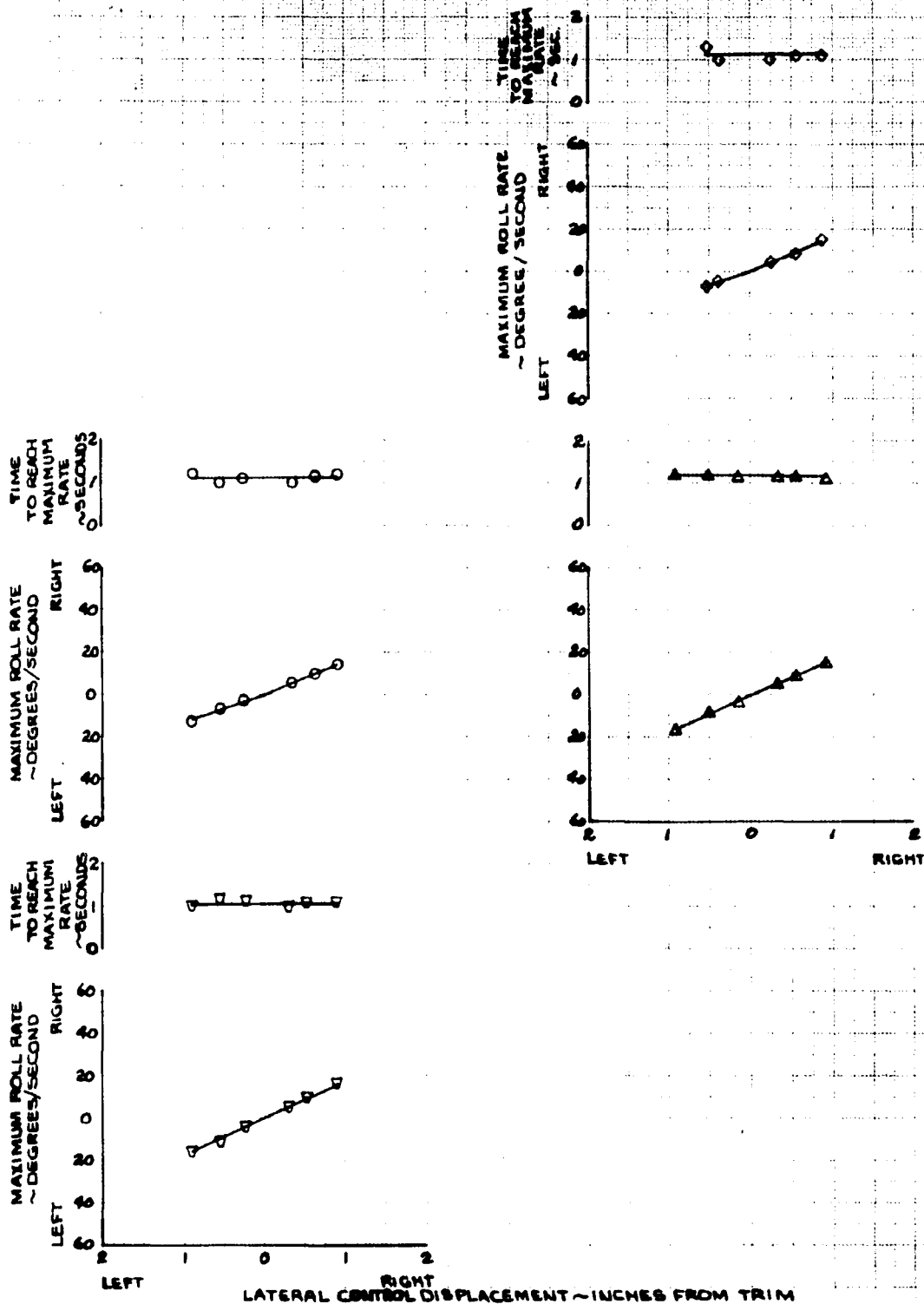


FIGURE NO. 202
LATERAL RESPONSE AT ONE SECOND

AH-1G USAF 718698
HVV SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIR SPEED ~ CAS	AVG. ALT. ~ HD ~ FT.	AVG. G.W. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT SYMBOL	THRUST COEFF. ~ CT
0	108.0	5770	9070	200.8(AFT)	3240	LEVEL FLIGHT	0.005850
7	143.0	5490	9240	200.2(AFT)	3240	LEVEL FLIGHT	0.005404
9	172.0	6310	9460	200.0(AFT)	3240	DIVE	0.005661
A	88.0	2870	9480	200.0(AFT)	3240	CLIMB	0.005124

NOTE: 517 LB. IN. OUTED ROCKET PODS

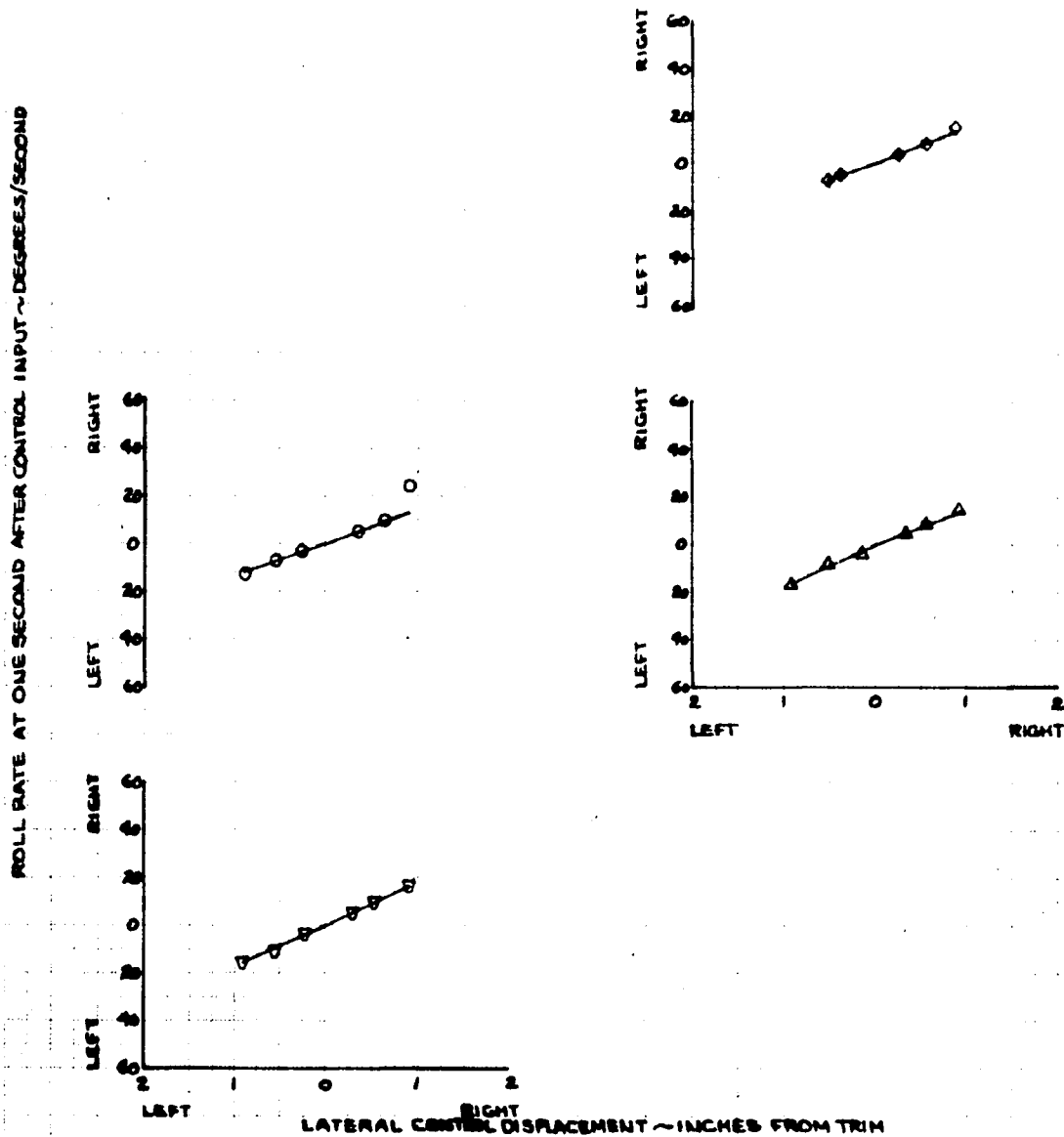


FIGURE NO. 205 ANGULAR ROLL DISPLACEMENT

AM-16 USAF 15698
HVV. SCOUT CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIR SPEED ~ CAS	AVG. ALT. H ₀ ~ FT.	AVG. GN. ~ LB.	AVG. LONG. CG ~ IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~ C _T
0	105.0	5770	4070	200.3 (IN)	324.0	LEVEL FLIGHT	0.008880
1	145.0	5440	4240	200.2 (IN)	324.0	LEVEL FLIGHT	0.005404
2	172.0	6310	4440	200.0 (IN)	324.0	DIVE	0.005661
3	58.0	2870	4480	200.0 (IN)	324.0	CLIMB	0.005124

NOTE: 817 LB IN OUTSIDE ROCKET PODS

ANGULAR ROLL DISPLACEMENT AT ONE SECOND AFTER CONTROL
INPUT ~ DEGREES FROM TRIM

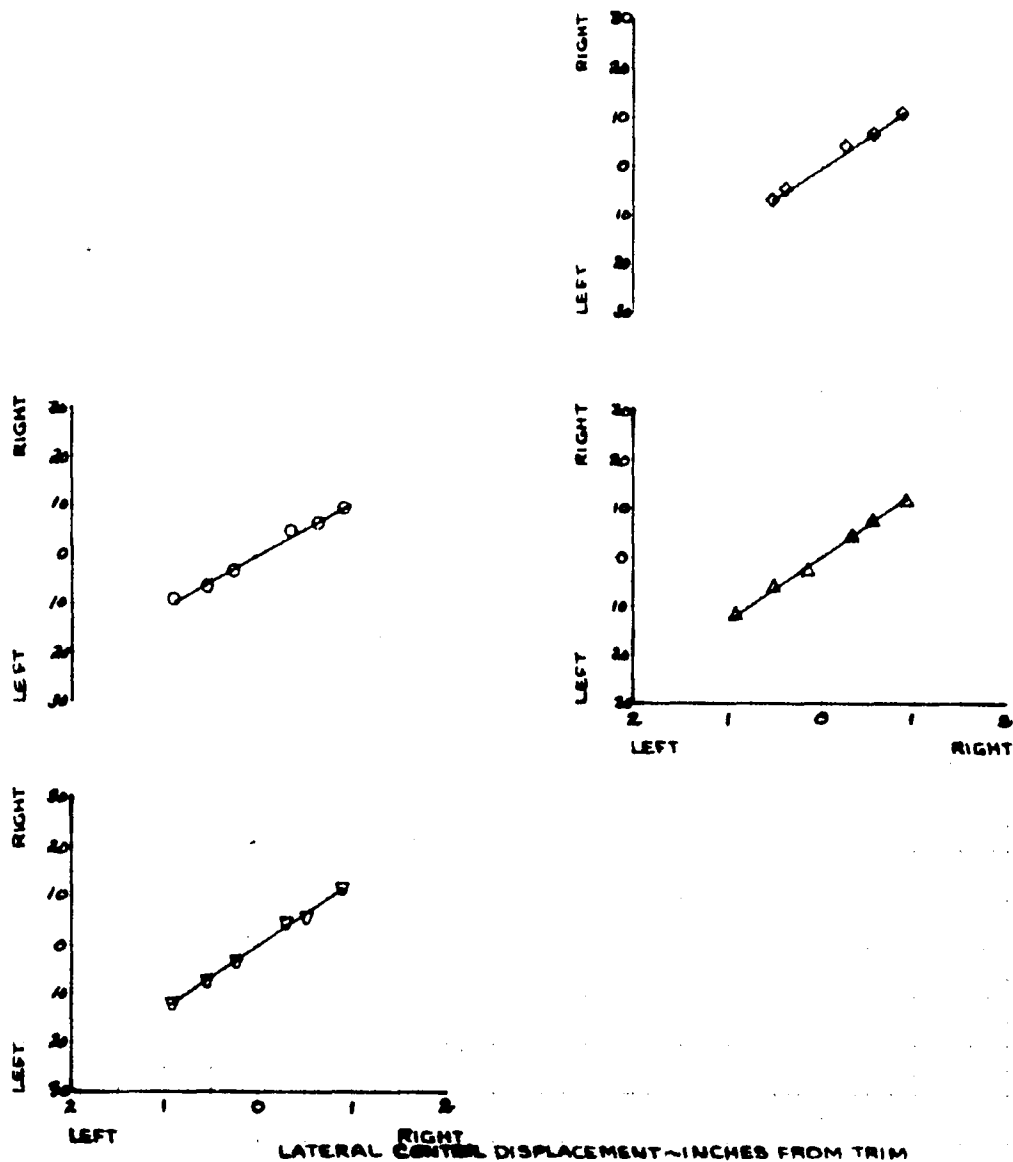
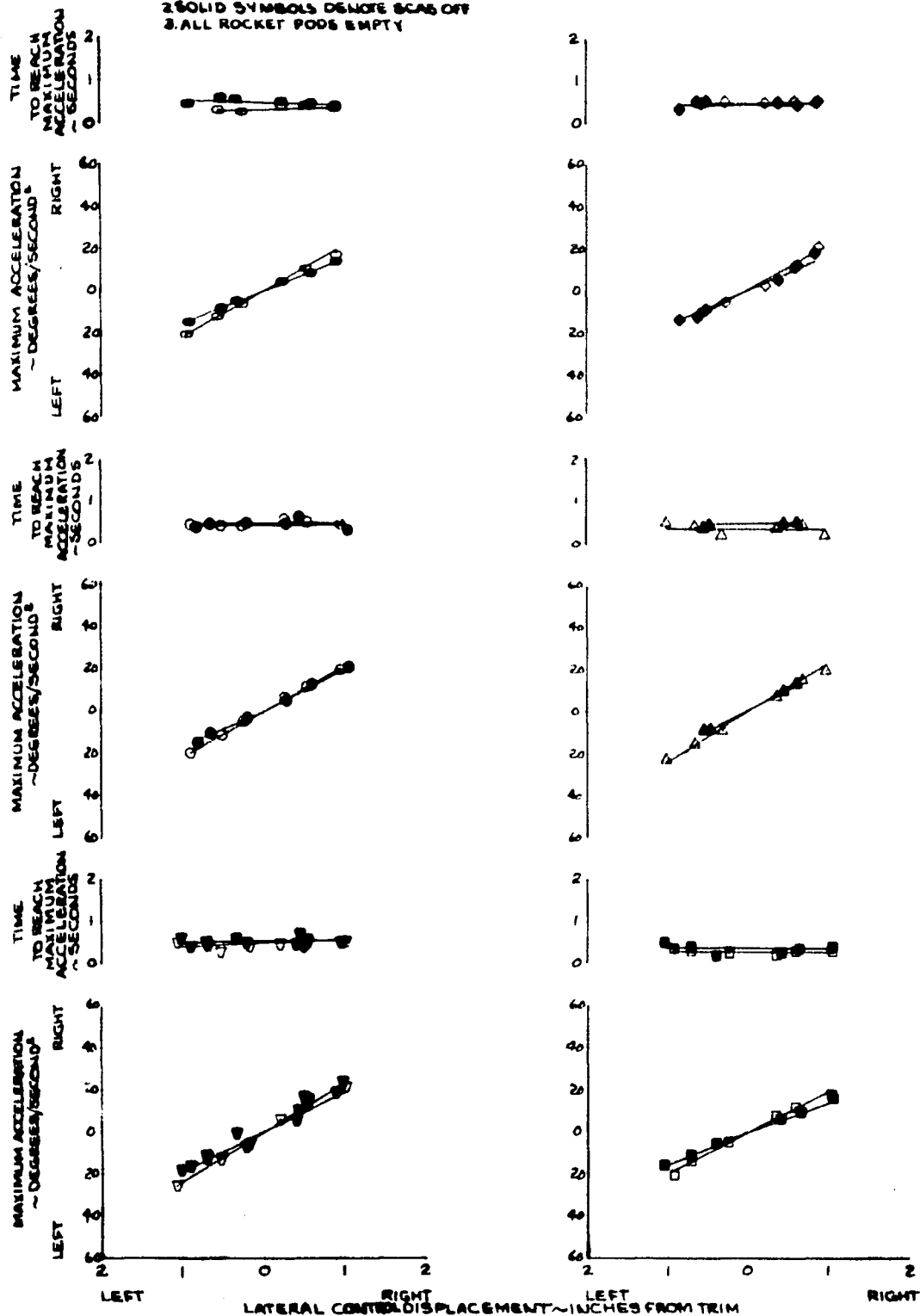


FIGURE No. 204 LATERAL CONTROL SENSITIVITY

AM-1G USAF T16C95
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

DYM	AIR SPEED ~ CAS	AVG. ALT. H ₀ ~ FT.	AVG. G.M. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C _T
00	63.0	3970	8790	195.1 (MID)	3250	LEVEL FLIGHT	0.004879
00	106.0	5160	8580	195.1 (MID)	3250	LEVEL FLIGHT	0.004904
00	146.5	5740	8550	196.0 (MID)	3245	LEVEL FLIGHT	0.005024
00	172.0	8180	8680	198.2 (MID)	3240	DIVE	0.005515
00	60.0	1550	8450	195.0 (MID)	3240	CLIMB	0.004890
00	67.0	6480	8460	195.0 (MID)	3100	AUTO ROTATION	0.005373

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY



AM-16 USARH15695
HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

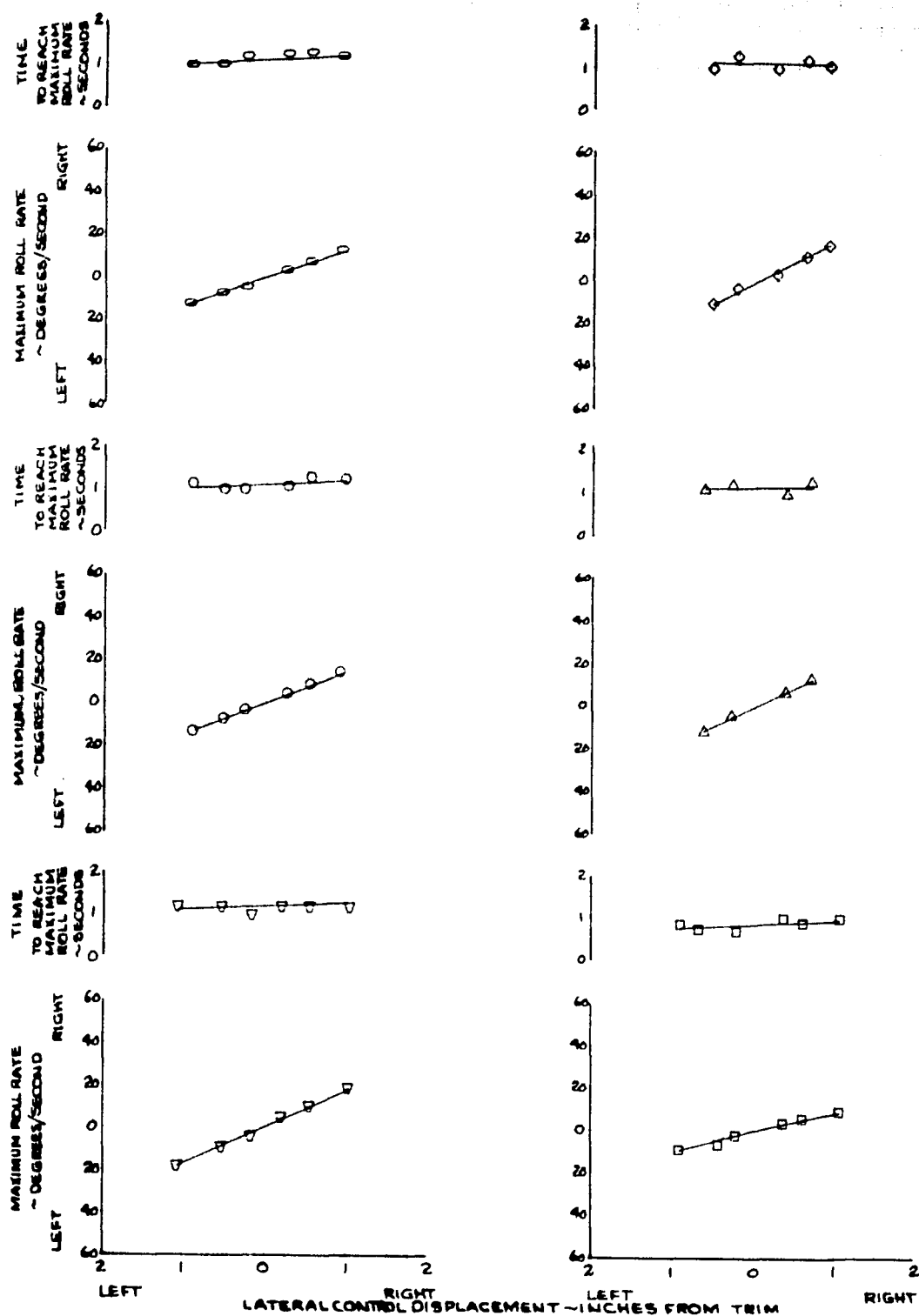
[illegible]

FIGURE No. 206
LATERAL RESPONSE AT ONE SECOND
 AH-1G USAF 718698
 MVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~KAS	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR FLIGHT CONDITION	THROTTLE COUNT ~ CT
●	63.0	5710	8740	195.1 (MID)	3250 LEVEL FLIGHT	0.00 4879
○	103.0	5160	8630	195.1 (MID)	3250 LEVEL FLIGHT	0.00 4404
▽	146.5	5140	8550	195.0 (MID)	3245 LEVEL FLIGHT	0.00 5034
◇	172.0	5180	8680	195.2 (MID)	3240 DIVE	0.00 5518
△	630	1550	8450	195.0 (MID)	3240 CLIMB	0.00 4959
□	670	1480	8460	195.0 (MID)	3100 AUTO ROTATION	0.00 3373

NOTES: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF
 ALL ROCKET PODS EMPTY.

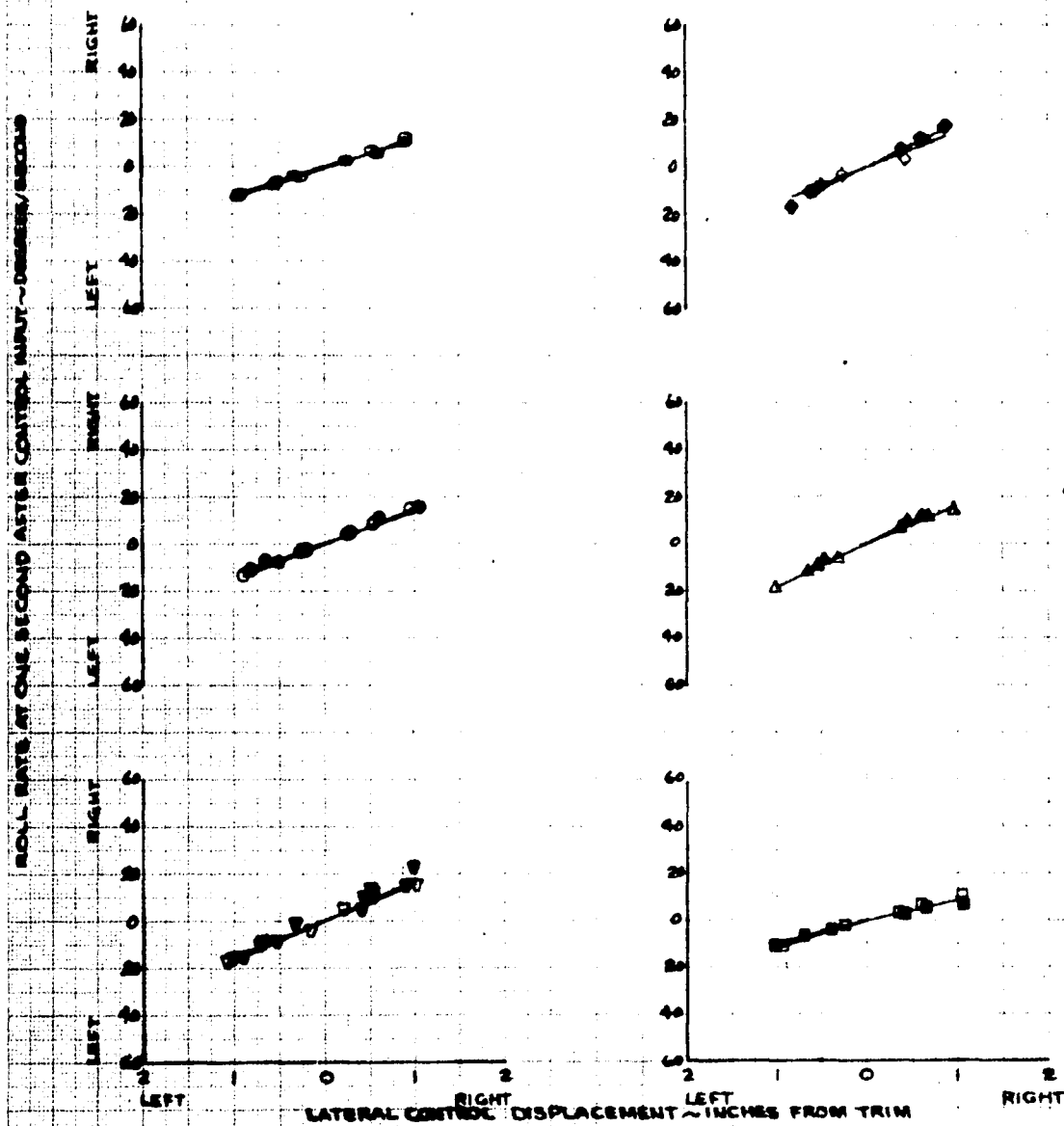


FIGURE No. 207 ANGULAR ROLL DISPLACEMENT

AH-1G USAF 15695
NAVY HQG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	MEASUREMENT	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. CG ~ IN.	ROTOR RPM	FLIGHT CONDITION	ROLL RATE ~ CT
000-000	SCAS	2070	8780	195.1 (WB)	2248	LEVEL FLIGHT	0.004879
	SCAS	2180	8880	195.1 (WB)	2248	LEVEL FLIGHT	0.004404
	SCAS	2760	8880	195.0 (WB)	2248	LEVEL FLIGHT	0.005024
	SCAS	3180	8880	195.2 (WB)	2248	DIVE	0.005515
000-000	SCAS	2070	8780	195.1 (WB)	2248	CLIMB	0.004879
	SCAS	2180	8880	195.1 (WB)	2248	CLIMB	0.004404
	SCAS	2760	8880	195.0 (WB)	2248	CLIMB	0.005024
	SCAS	3180	8880	195.2 (WB)	2248	AUTOROTATION	0.005515

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS EMPTY

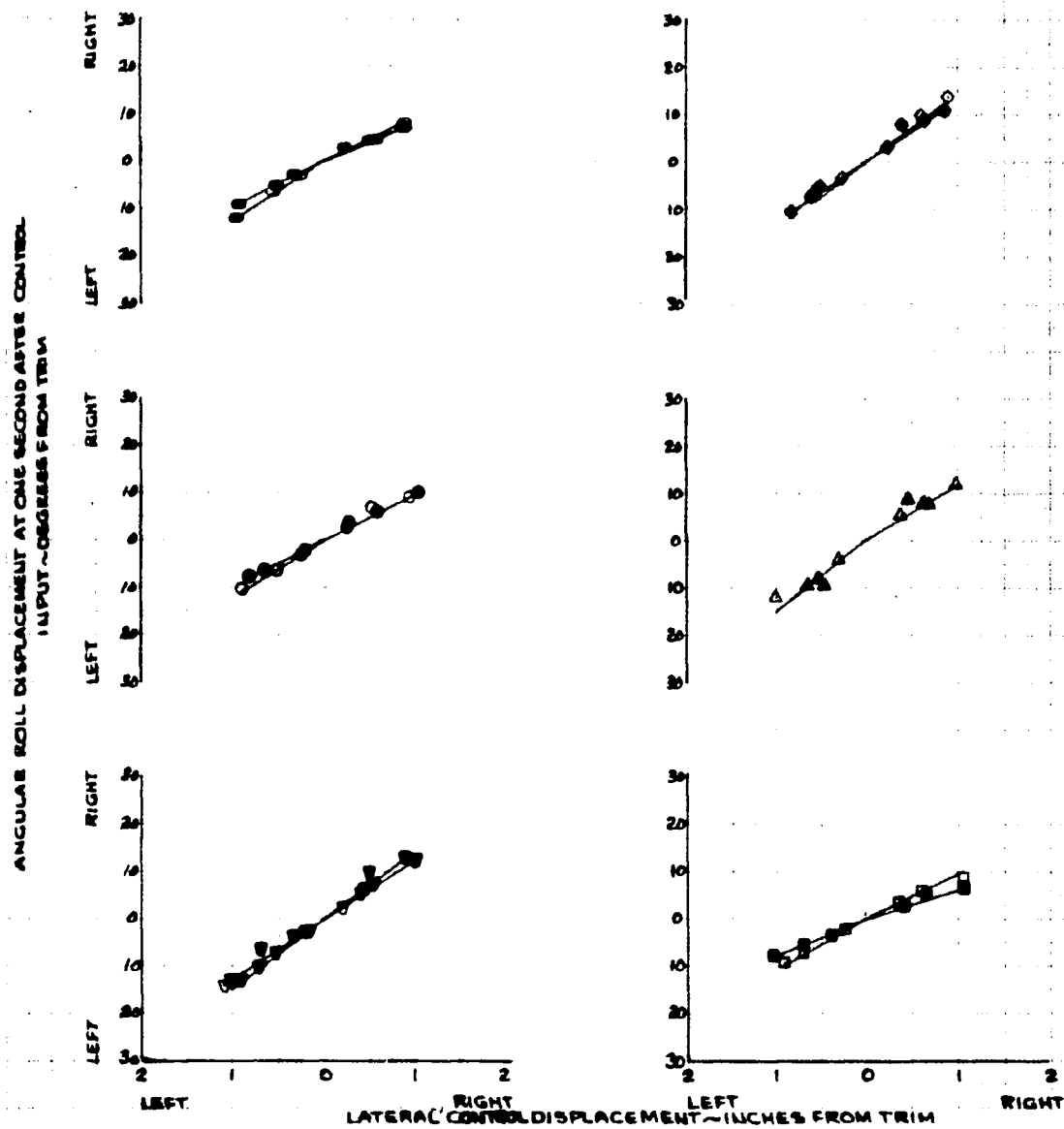


FIGURE No. 208
LATERAL CONTROL SENSITIVITY
 AH-1G USAM715698

SYM	AIR SPEED ~KAS	AVG. ALT. ~FT.	AIRWGT. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR SPEED ~RPM	FLIGHT CONDITION	THRUST COEFF ~C _T
000	60.0	3180	8820	195.1	3240	LEVEL FLIGHT	0.00 4817
010	106.0	3630	8720	195.0	3240	LEVEL FLIGHT	0.00 4827
020	144.0	4100	8610	195.1	3240	LEVEL FLIGHT	0.00 4940
030	181.0	6680	8560	194.8	3240	DIVE	0.00 5192
040	60.0	980	9050	197.5	3240	CLIMB	0.00 4625
050	12.0	5580	9000	197.5	310.0	AUTO ROTATION	0.00 5766

NOTES: OPEN SYMBOLS DENOTE SCAB ON
 & SOLID SYMBOLS DENOTE SCAB OFF
 ALL ROCKET PODS FULLY LOADED (1654 LB)

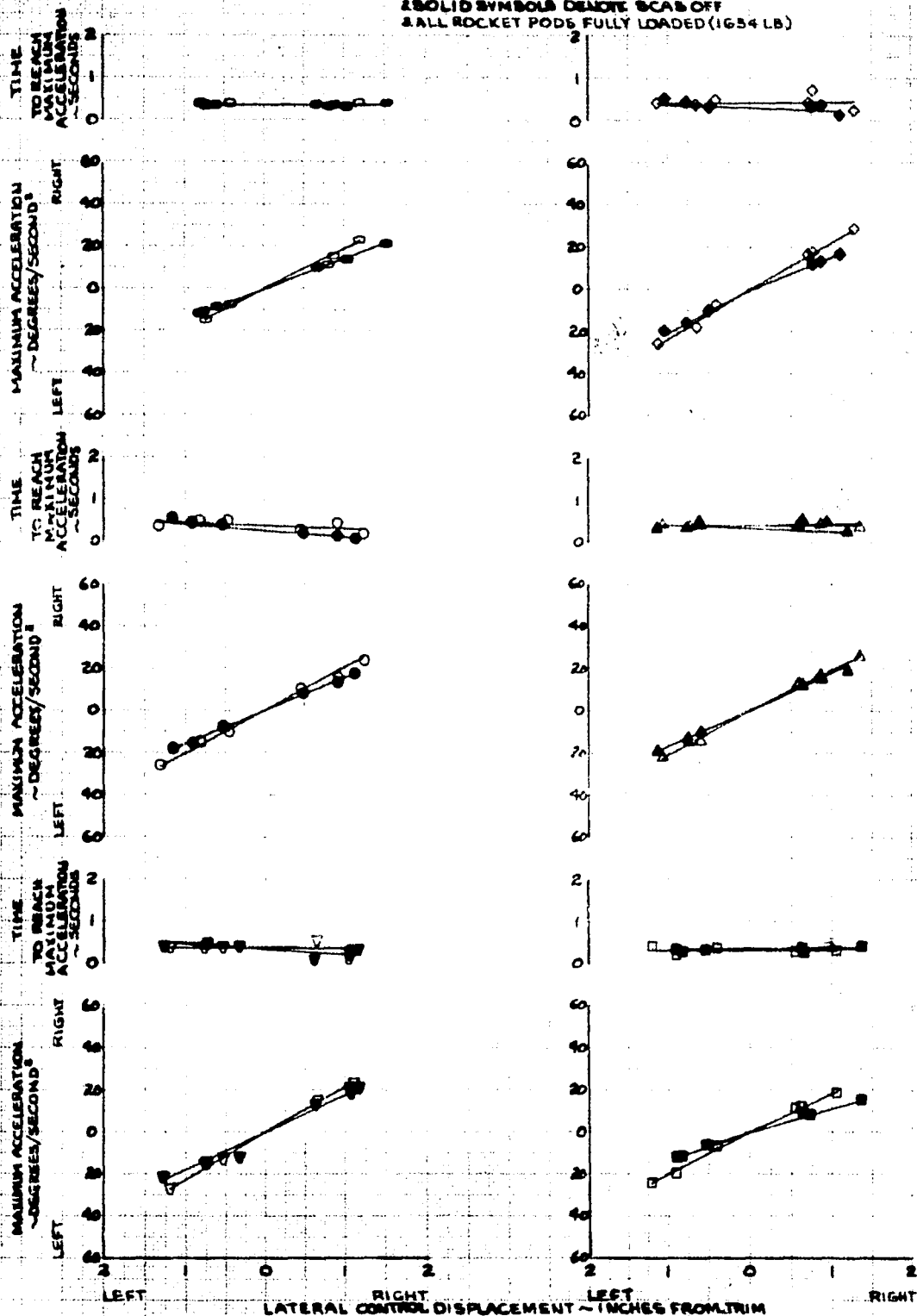


FIGURE No. 209
LATERAL CONTROL RESPONSE

AH-1G USAF 715648
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
6 CAS ON

SYM	AIRSPED ~ CAS	AVG. ALT. H ₁ ~ FT.	AVG. GW ~ LB.	AVG. LONG C.G. ~ IN.	ROTOR PLIGHT CONDITION	TIME TO REACH ~ SECONDS
□	60.0	3180	8830	195.1 (HUB)	3248 LEVEL FLIGHT	0.004817
△	106.0	3630	8730	195.0 (HUB)	3248 LEVEL FLIGHT	0.005821
○	144.0	4100	8810	195.1 (HUB)	3248 LEVEL FLIGHT	0.006440
◇	181.0	6680	8560	195.0 (HUB)	3248 DIVE	0.005192
▽	600	980	9050	197.5 (HUB)	3248 CLIMB	0.004685
◻	720	5580	9000	197.5 (HUB)	3108 AUTOROTATION	0.005766

NOTE: ALL ROCKET PODS FULLY LOADED (1634 LB)

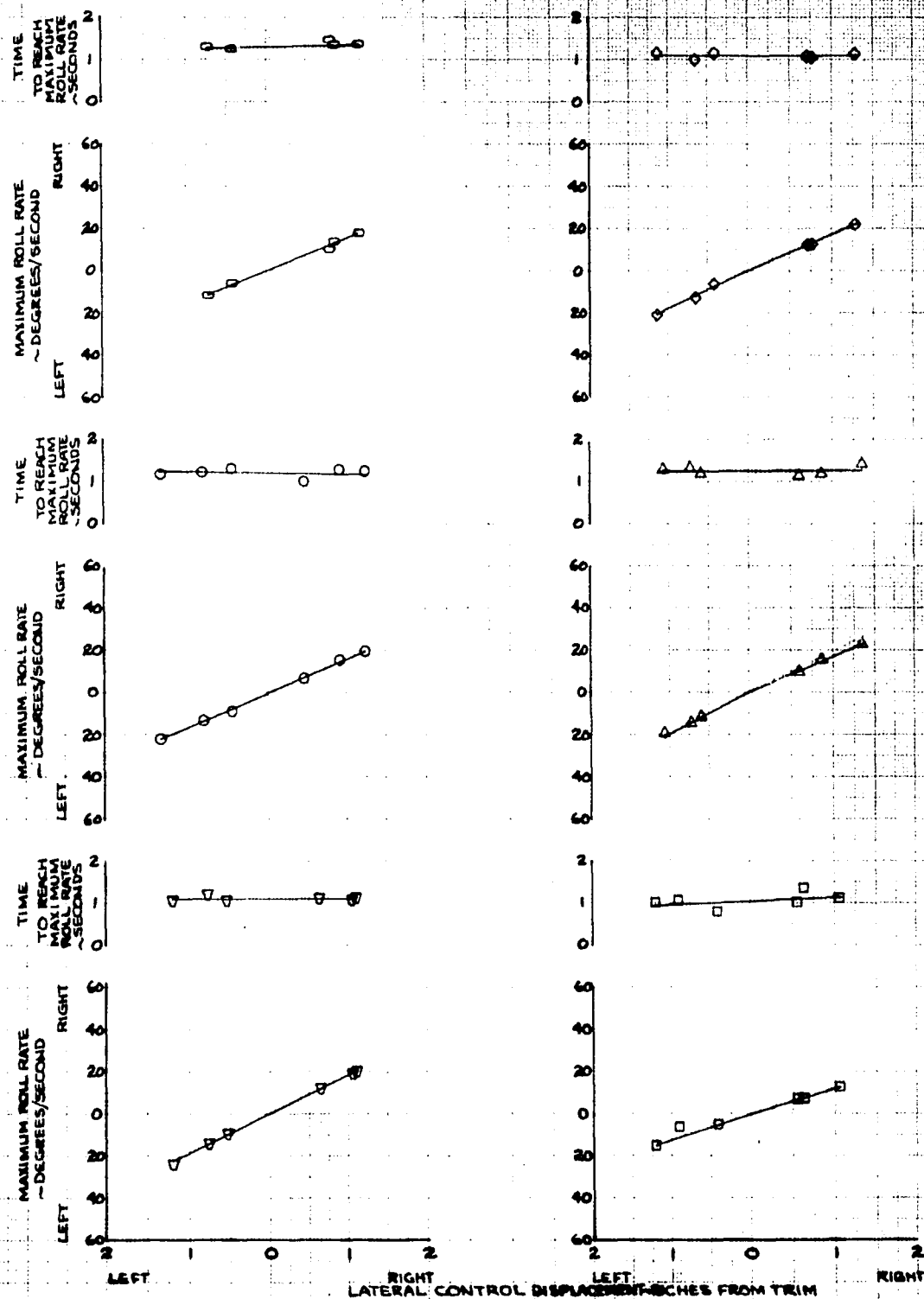


FIGURE No. 210
LATERAL RESPONSE AT ONE SECOND

AM-1B USA 64715648

HVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	ANG. ALT. M ₀ ~ FT.	AVG. S.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR FLIGHT CONDITION RPM	THrust CSM ₁ ~ CT
8000	60.0	3180	8880	195.1 (MID)	324.0	LEVEL FLIGHT 0.004817
0000	106.0	3680	8130	193.0 (MID)	324.0	LEVEL FLIGHT 0.004821
0000	144.0	4100	8810	195.1 (MID)	324.0	LEVEL FLIGHT 0.004940
0000	181.0	6680	8560	194.8 (MID)	324.0	DIVE 0.005192
0000	60.0	980	9080	197.5 (MID)	324.0	CLIMB 0.004625
0000	72.0	5680	9000	197.5 (MID)	310.0	AUTOROTATION 0.005766

NOTES: OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (163+LB)

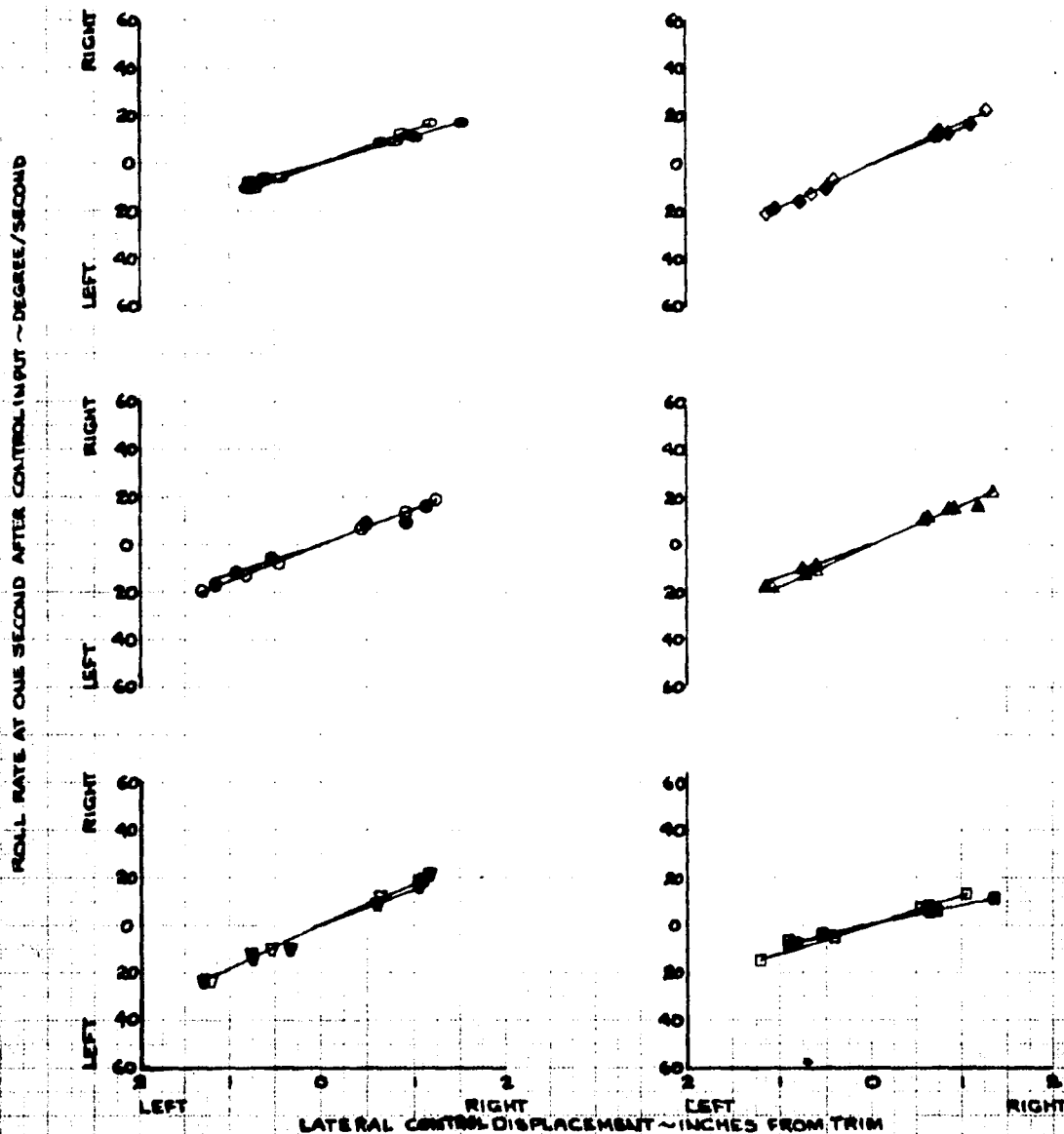
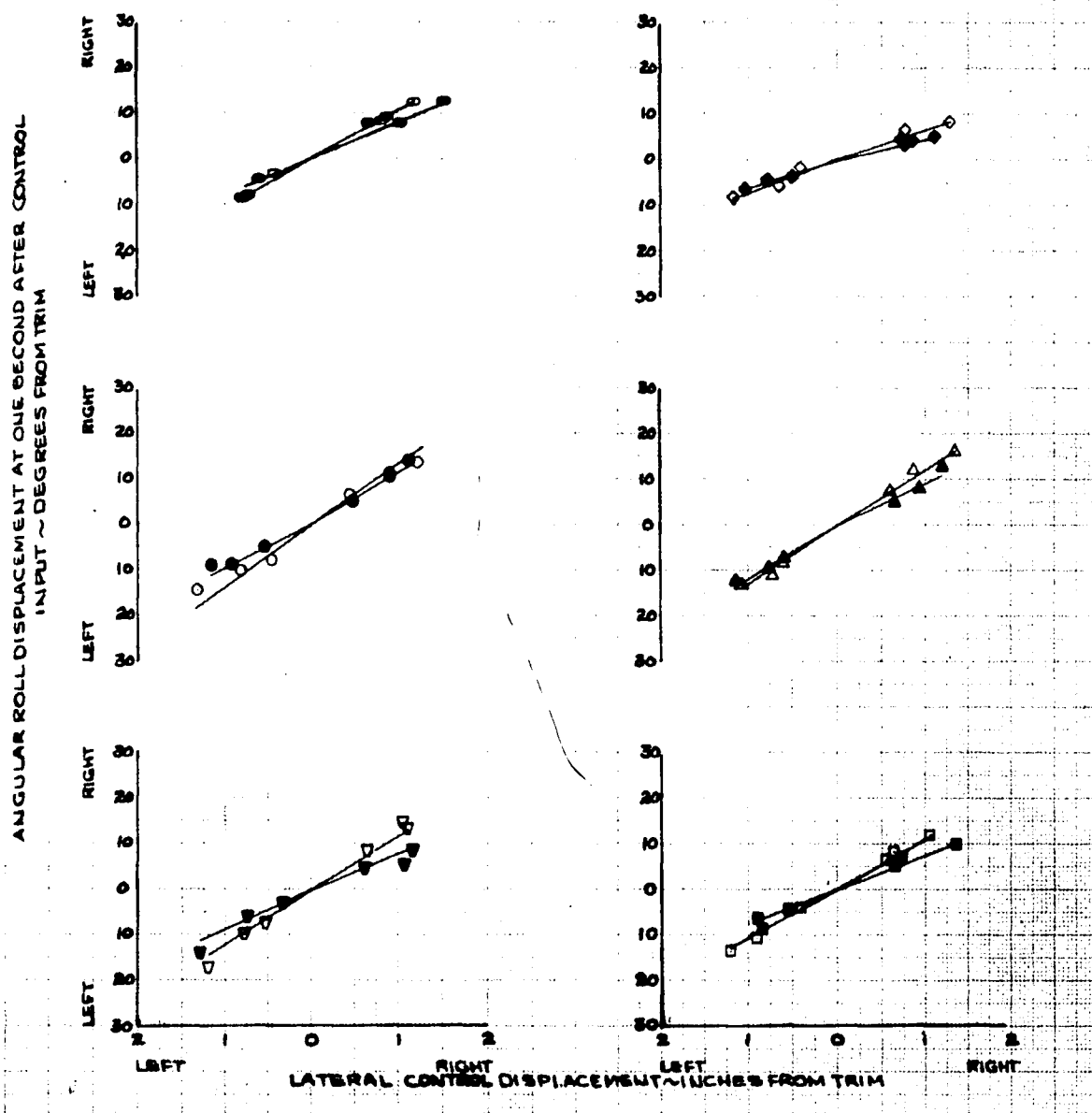


FIGURE No. 211 ANGULAR ROLL DISPLACEMENT

AM-1C USAF 118695
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	AVG. ALT. MO-FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF-C _T
○	620	3000	8200	195.1(MID)	3240	LEVEL FLIGHT	0.004817
◻	1060	3450	8150	195.0(MID)	3240	LEVEL FLIGHT	0.004827
◊	1440	4100	8810	195.1(MID)	3240	LEVEL FLIGHT	0.004440
△	1810	6500	8560	194.8(MID)	3240	DIVE	0.005192
□	620	980	9060	197.3(MID)	3240	CLIMB	0.004625
◻	720	5500	9000	197.5(MID)	3100	AUTOROTATION	0.005766

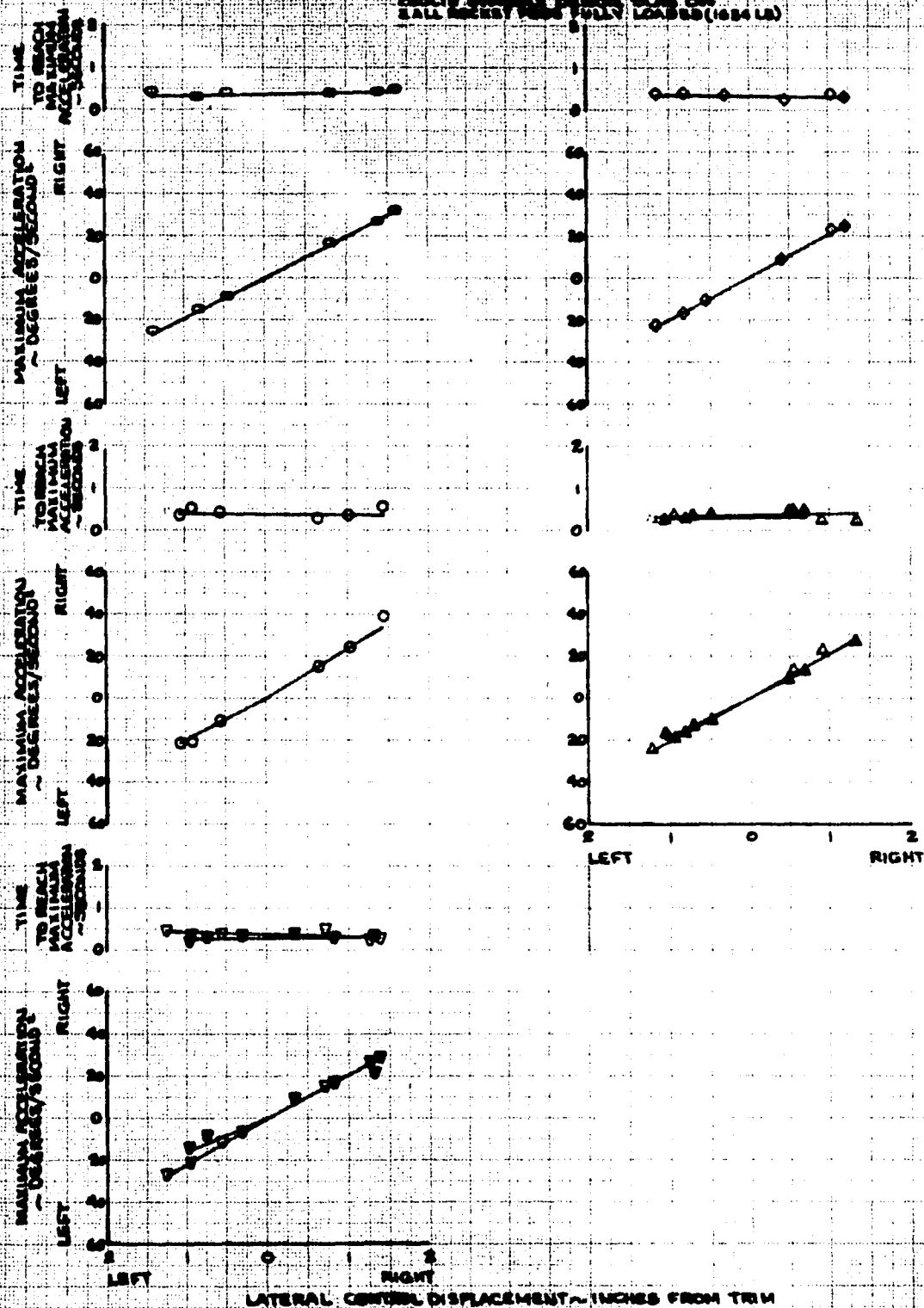
NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB)



AN-6 USA TIGERS
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPD ~CAS	ANG. ALT ~FT	ANG. SW ~LS	AIRLOAS CG ~IN	ROTSPD RPM	PRNT	CMPSTR	THRUST	COMP
0	51.0	4000	1.00	2.00 (0.00)	3200	LEVEL	FLIGHT	0.00	2475
1	105.0	3270	0.90	2.00 (1.00)	3200	LEVEL	FLIGHT	0.00	5042
2	150.0	2450	0.80	2.00 (1.00)	3200	LEVEL	FLIGHT	0.00	5482
3	170.5	2010	0.70	1.95 (1.00)	3100	DIVE		0.00	5161
4	01.0	0100	0.50	1.00 (1.00)	3100	CLIMB		0.00	5211

MOTOCYCLE SHOOTER GUNTS SCAR ON
 220LB SHOOTER DESIGN SCAR OFF
 BALL MCKET TUBE FULLY LOADED (1000 LB)



AMIG URA 4715695
MVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

NOTE: ALL ROCKET PODS FULLY LOADED (1634 LB.)



FIGURE NO. 214
LATERAL RESPONSE AT ONE SECOND

AH-1G USAF T15695
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPEED ~CAS	AVG. ALT. ~FT.	AVG. G.N. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THrust Coeff ~C _T
0	635	4590	9520	200.0 (AFT)	5240	LEVEL FLIGHT	0.005475
○	1080	5270	9850	200.0 (AFT)	5240	LEVEL FLIGHT	0.005488
◇	1350	6450	9020	200.1 (AFT)	5240	LEVEL FLIGHT	0.005488
◇	1705	6870	9420	199.6 (AFT)	5240	DIVE	0.005747
△	615	5190	9560	199.7 (AFT)	5240	CLIMB	0.005317

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED (1634 LB)

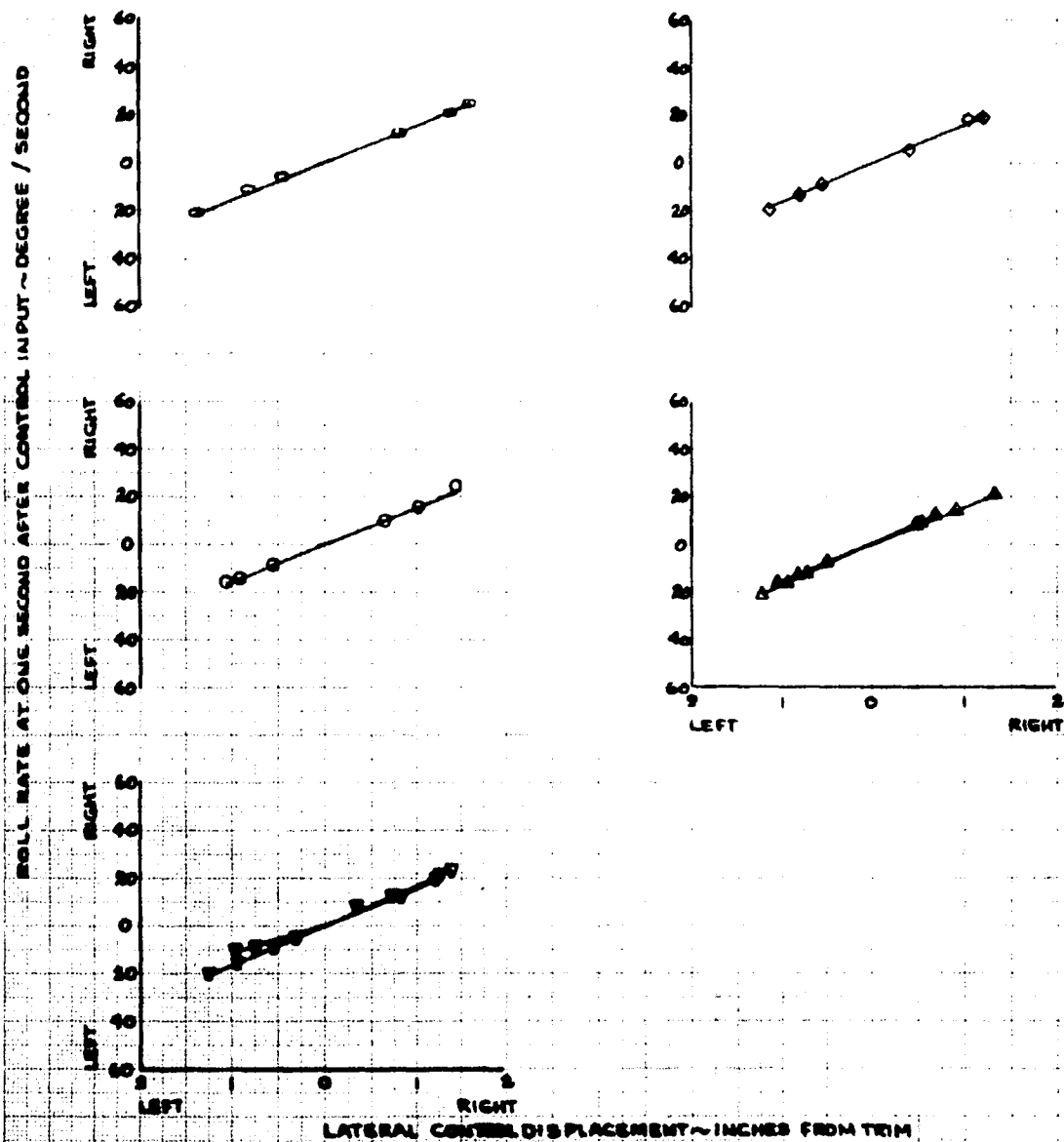


FIGURE NO 215 ANGULAR ROLL DISPLACEMENT

AM-1G USAF 715648
NAVY HSG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~KTS	AVG. ALT. H ₀ ~FT.	AVG. S.M. ~LB	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~C _T
000	61.5	4590	4620	300.0(AFT)	3240	LEVEL FLIGHT	0.005475
000	108.0	5270	4850	300.1(AFT)	3240	LEVEL FLIGHT	0.005432
000	135.0	6480	4920	200.1(AFT)	3240	LEVEL FLIGHT	0.005432
000	170.5	6870	4920	199.6(AFT)	3240	DIVE	0.005747
000	61.5	5190	4860	199.7(AFT)	3240	CLIMB	0.005217

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL ROCKET PODS FULLY LOADED(1634 LB)

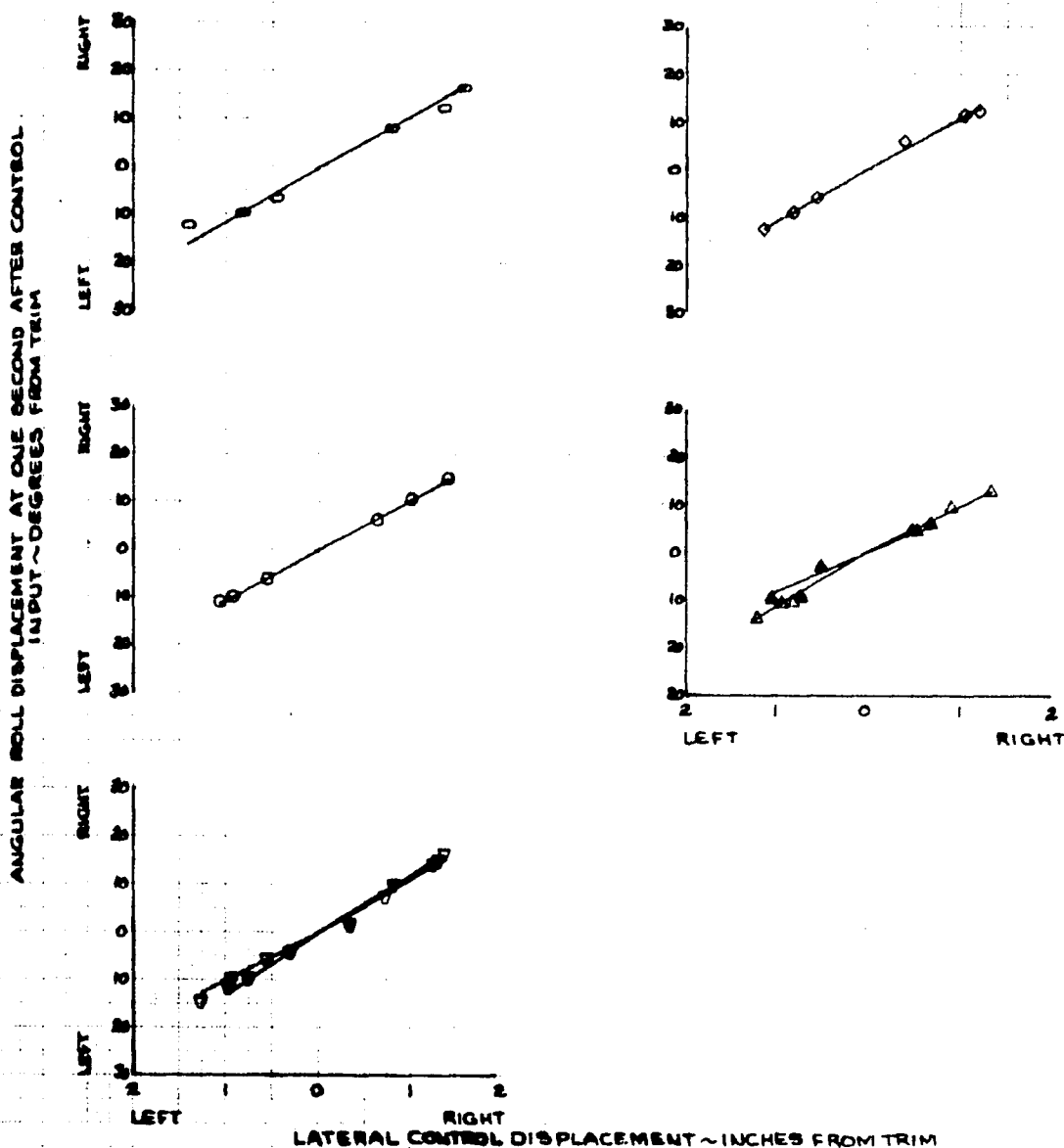


FIGURE No. 216 LATERAL CONTROL SENSITIVITY

AM-16 UGARS 15695
NAV. NOG CONFIGURATION WITH ROCKET RESTRAINTS REMOVED

SYM.	ALTITUDE - FT	Avg. ALT. - FT	Avg. SM. - LB	Avg. LWB. - LB	ENGINE RPM	FLIGHT CONDITION	THROTTLE % C1
000000	6500	5400	7770	200.0 (WT)	3200	LEVEL FLIGHT	0.00-4.00
	10000	5400	8000	200.0 (WT)	3200	LEVEL FLIGHT	0.00-4.00
	15000	5400	7500	200.0 (WT)	3200	LEVEL FLIGHT	0.00-4.00
	17200	7600	7800	200.0 (WT)	3250	DIVE	0.00-4.00
	6000	3570	7740	200.0 (WT)	3200	CLIMB	0.00-4.00
	6700	7200	7800	200.0 (WT)	3200	AUTO ROTATION	0.00-4.00

UPPER OPEN CIRCLES DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS ON
ALL ROCKET PODS EMPTY

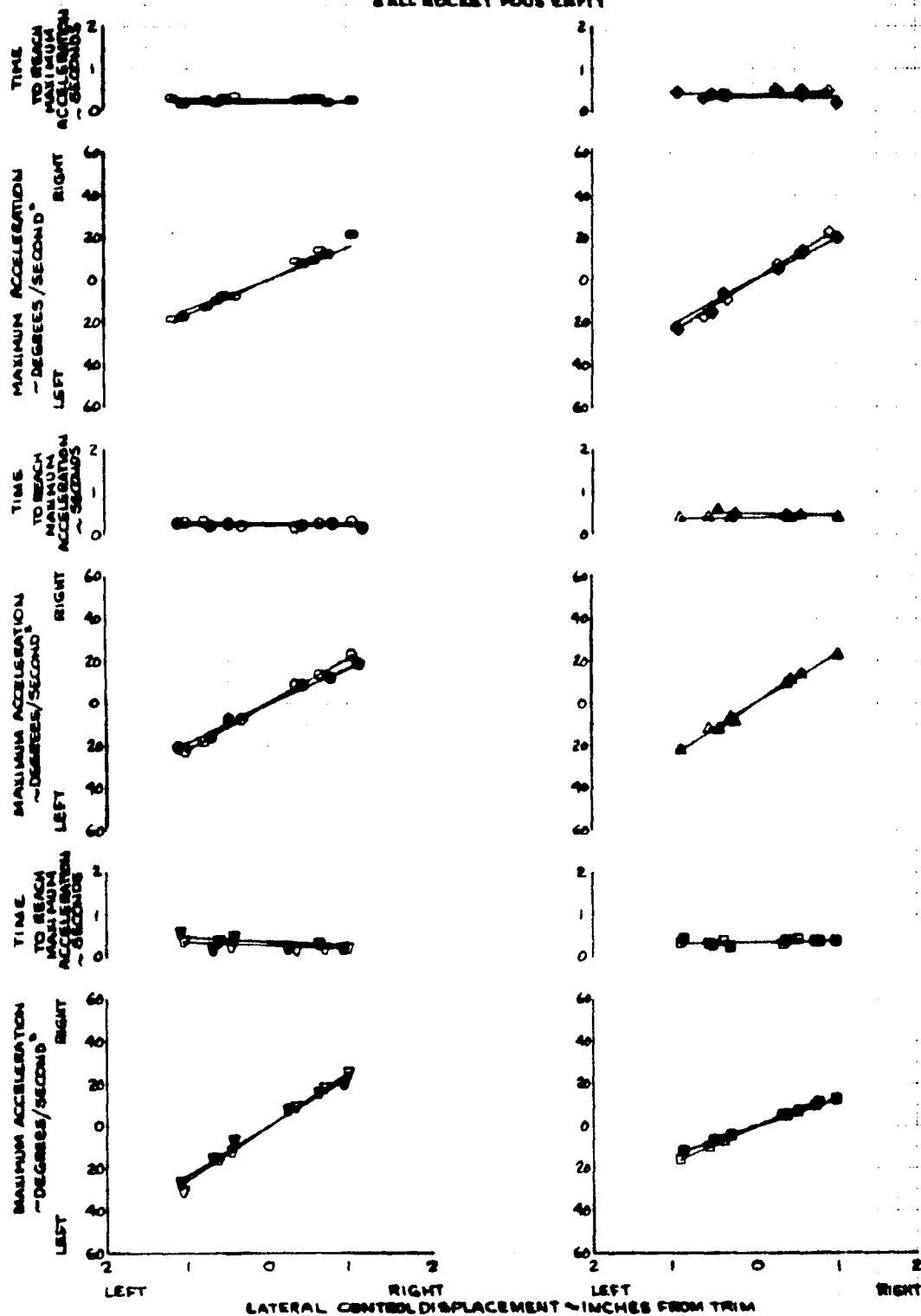


FIGURE NO 217 LATERAL CONTROL RESPONSE

AN-16 LEASER/SCAR
NAVY HOG CONFIGURATION WITH SCARST PDS FAIRINGS REMOVED
SCAS ON

DATA	ALTIMETER ~CAS	AUG ALT ~10-20	AUG SM ~10	AUG LENS ~10	SCAR FLIGHT CONDITION	TIME TO REACH MAXIMUM ~SECONDS
0.0	152.5	122.5	111.5	100.0	LEVEL FLIGHT	0.00 2121
0.0	152.5	122.5	111.5	100.0	LEVEL FLIGHT	0.00 2121
0.0	172.0	124.0	112.0	100.0	LEVEL FLIGHT	0.00 4451
0.0	172.0	124.0	112.0	100.0	DIVE	0.00 4546
0.0	172.0	124.0	112.0	100.0	CLIMB	0.00 4550
0.0	172.0	124.0	112.0	100.0	SCAR AUTOMATION	0.00 4407

NOTE: SEE SCARST PDS FAIRINGS REMOVED

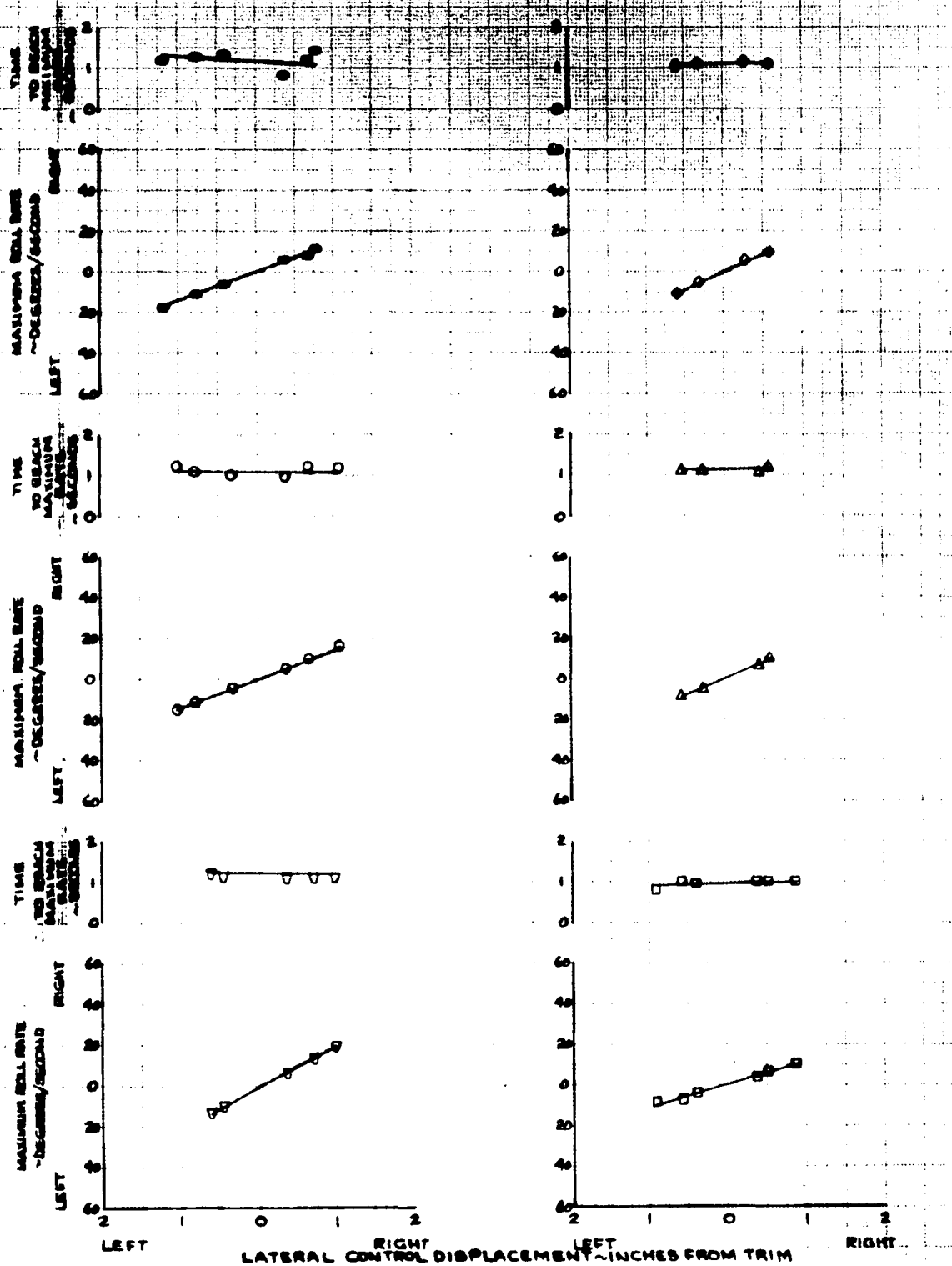
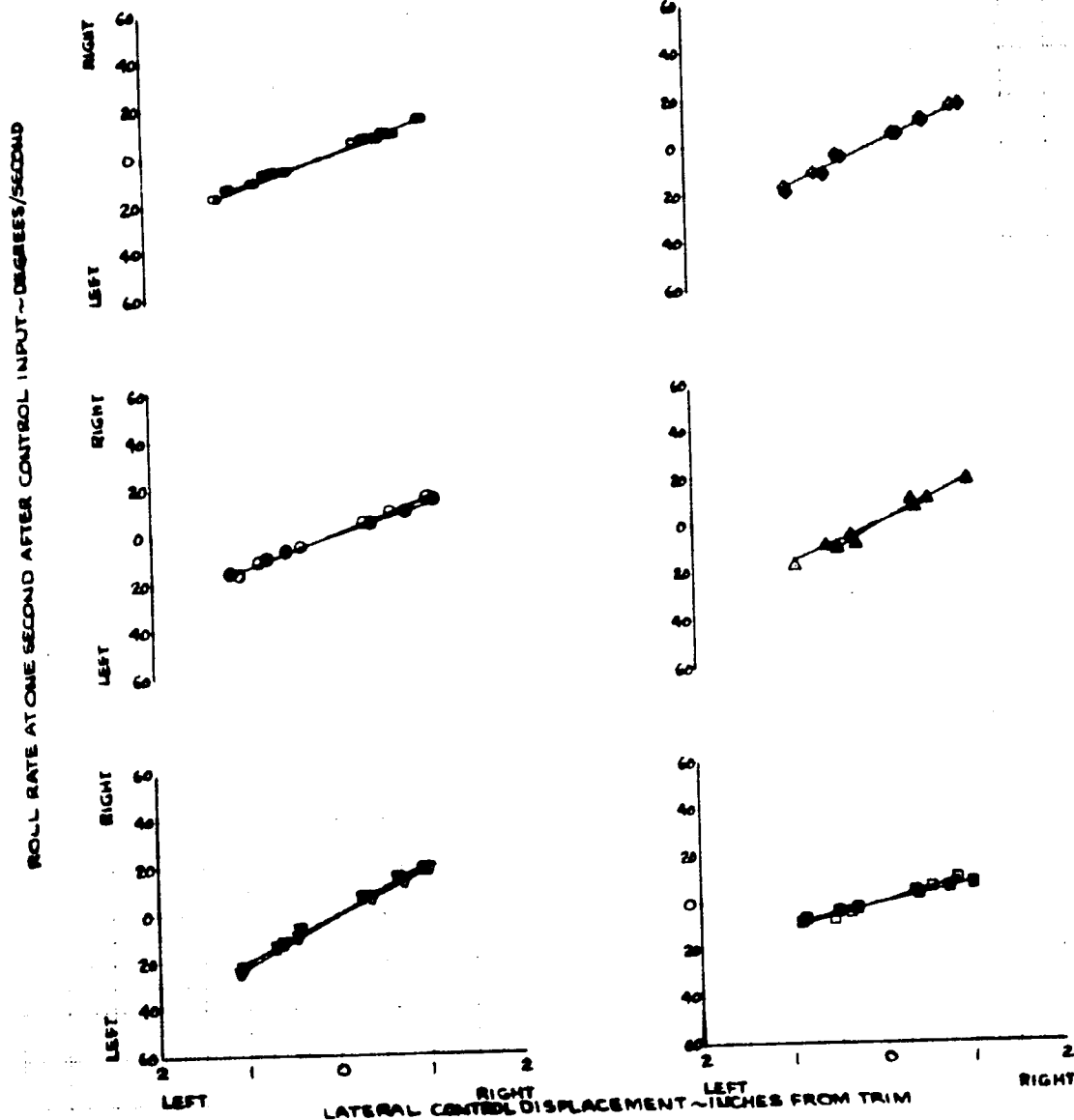


FIGURE NO. 218
LATERAL RESPONSE AT ONE SECOND
AH-1G USAF 15698
HYV HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~CAS	Avg. ALT. ~FT.	Avg. G.H. ~LB.	Avg. LONG. CS ~IN.	ROTOR SPEED ~RPM	ROTOR POSITION ~DEGREES	THROTTLE DEFT ~CT
○	140	2400	7770	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	150	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	160	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	170	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	180	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	190	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	200	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	210	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	220	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	230	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	240	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	250	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	260	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	270	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	280	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	290	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	300	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	310	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	320	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	330	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	340	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	350	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	360	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	370	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	380	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	390	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	400	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	410	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	420	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	430	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	440	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	450	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	460	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	470	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	480	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	490	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	500	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	510	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	520	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	530	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	540	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	550	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	560	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	570	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	580	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	590	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	600	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	610	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	620	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	630	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	640	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	650	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	660	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	670	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	680	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	690	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	700	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	710	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	720	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	730	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	740	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	750	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	760	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	770	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	780	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	790	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	800	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	810	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	820	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	830	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	840	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	850	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	860	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	870	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	880	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	890	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	900	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	910	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	920	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	930	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	940	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	950	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	960	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	970	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	980	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	990	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001
○	1000	2400	8000	200 (AFT)	3200	LEVEL FLIGHT	0.004001

NOTES: OPEN SYMBOLS DEMONSTRATE SCAS ON
 SOLID SYMBOLS DEMONSTRATE SCAS ON
 ALL ROCKET PODS EMPTY



AM-16 USAF715679
HVV. HOG CONFIGURATION WITH ROCKET PODS AND 16 REMOVED

SYM	ALTIMETER ~ CAS	AIR ALT M	AIR ALT ~ F	AIR SPEED CAS	AIR SPEED ~ KTS	TIME	FLIGHT LEVEL	TIME
BODDOWN	102.5	5040	15400	200	370	000000	FLIGHT LEVEL 100	000000
	102.5	5040	15400	200	370	000000	FLIGHT LEVEL 100	000000
	102.5	5040	15400	200	370	000000	FLIGHT LEVEL 100	000000
	102.5	5040	15400	200	370	000000	FLIGHT LEVEL 100	000000

NOTE: 1. OPEN WHEELS DENOTE SCAS ON
2. SOLID WHEELS DENOTE SCAS OFF
3. ALL ROCKS FORTHENPT

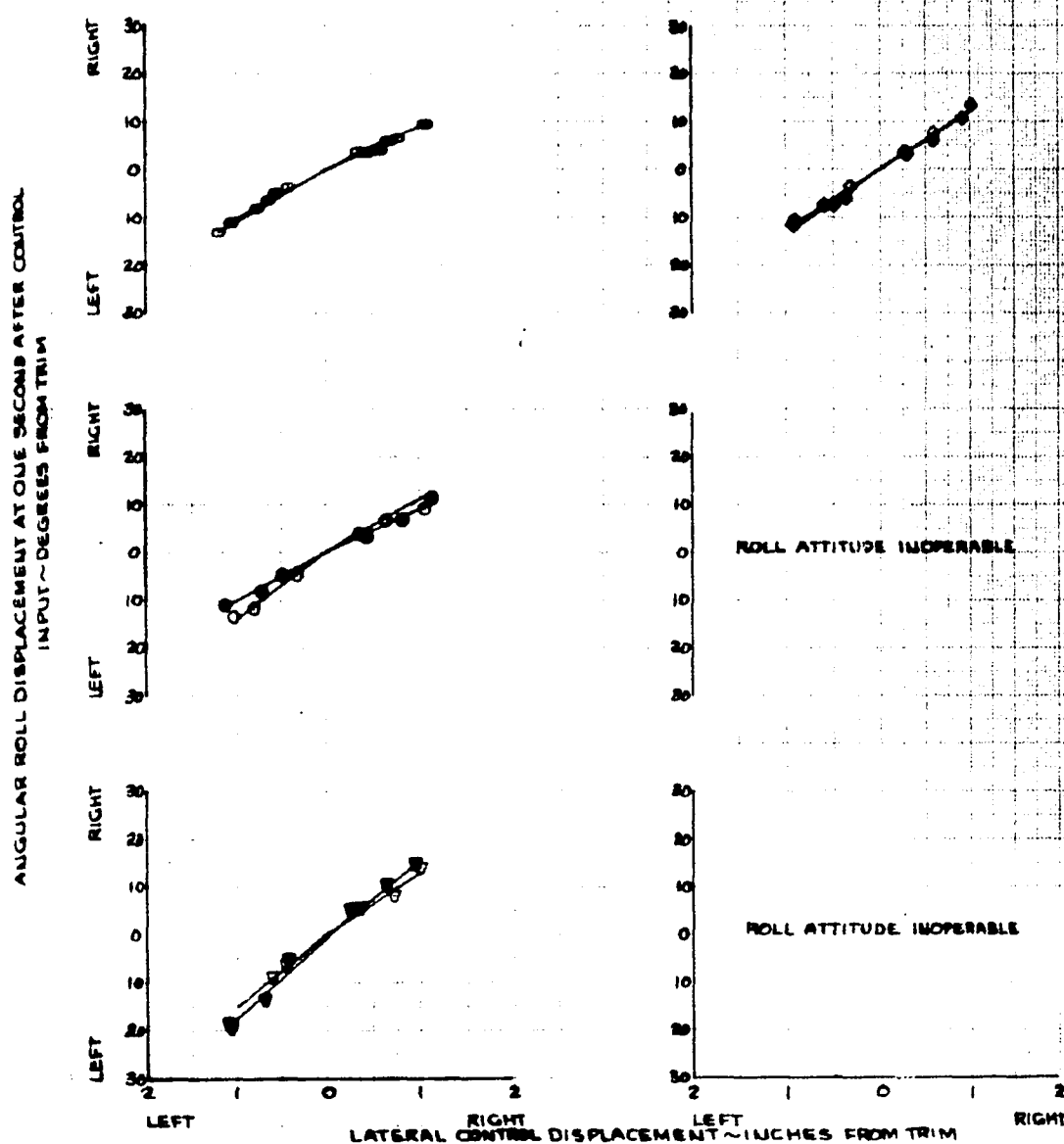


FIGURE No. 220 LATERAL CONTROL SENSITIVITY

AM-1G USAF T15078
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	AVG ALT. H ₀ ~ FT.	AVG G.M. ~ LB.	AVG LONG C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ CT
00	53.0	16160	1190	200.9 (MT)	3240	LEVEL FLIGHT	0.006205
0	88.0	17070	1500	200.8 (MT)	3240	LEVEL FLIGHT	0.006352
0	105.0	16160	1680	200.8 (MT)	3240	LEVEL FLIGHT	0.006884

NOTES: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS EMPTY

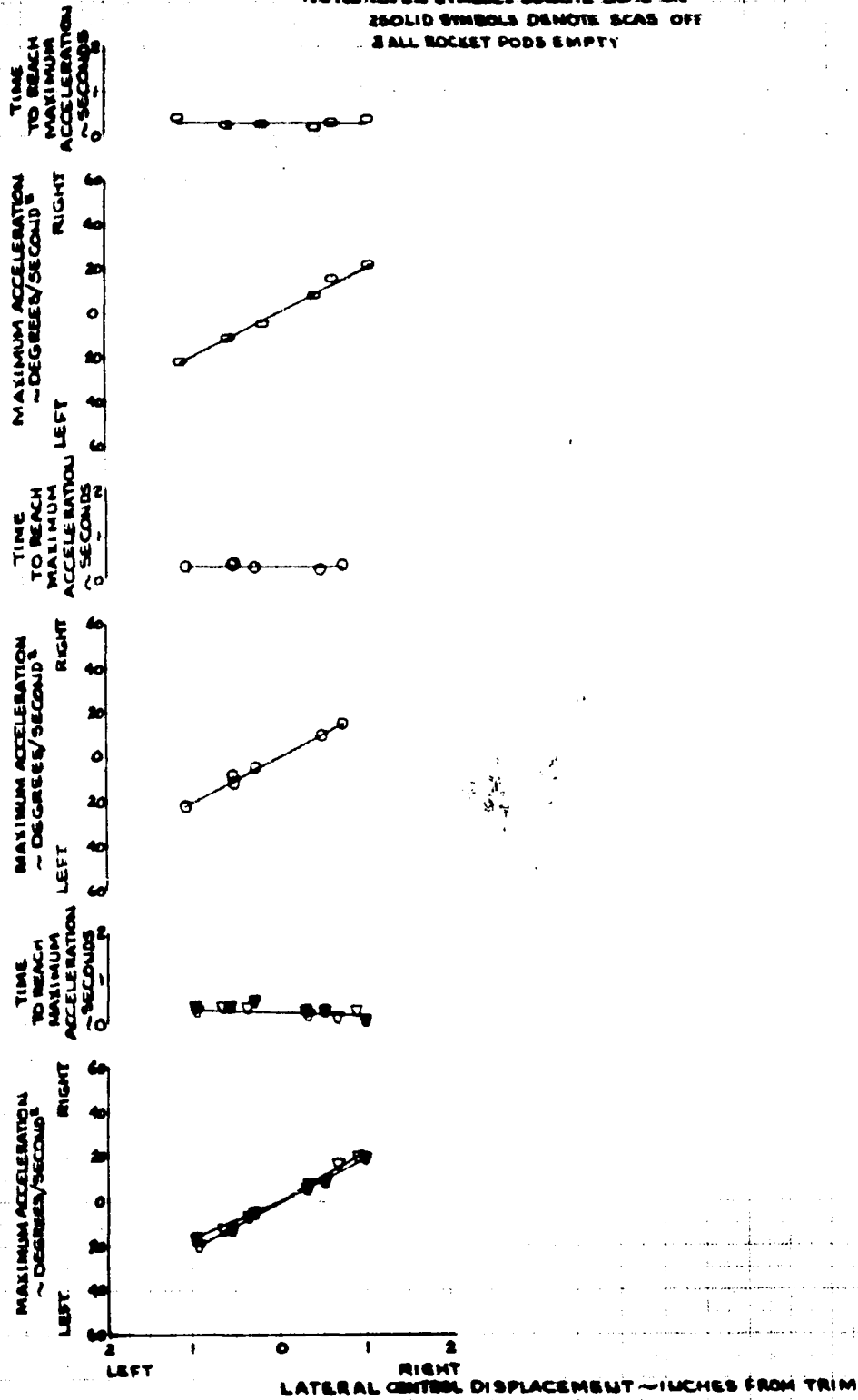


FIGURE NO. 221 LATERAL CONTROL RESPONSE

AN-10 USA 571648
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AIR SPEED	AVG. ALT.	AVG. G.M.	AVG. LONG.	WING AREA	WING SPAN	WING AREA	WING AREA
OS	530	15160	7190	300 (WFT)	3240	LEVEL FLIGHT	0.005132	
VS	1050	17010	7500	300 (WFT)	3240	LEVEL FLIGHT	0.005132	

NOTE: ALL ROCKET PODS REMOVED



FIGURE No 222 LATERAL RESPONSE AT ONE SECOND

AH-1G USAF 715648
HVV HOG CONFIGURATION: INTER-ROCKET POD FAIRINGS REMOVED

DYM	AIR SPEED ~ CAS	AVE. ALT. ~ FT	AVE. S.M. ~ LB	AVE. LONG. C.G. ~ IN.	ROT. SPEED RPM	ROT. DIR.	ROT. RATE DEG/SEC	ROT. TIME SEC
800	850	16150	7790	200.0 (40)	3325	LEFT	11.1	0.0000
0	1050	16150	7630	200.0 (40)	3345	LEVEL FLIGHT	0.0000	0.0000

NOTES: OPEN SYMBOLS DENOTE SCAS ON
A SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS EMPTY

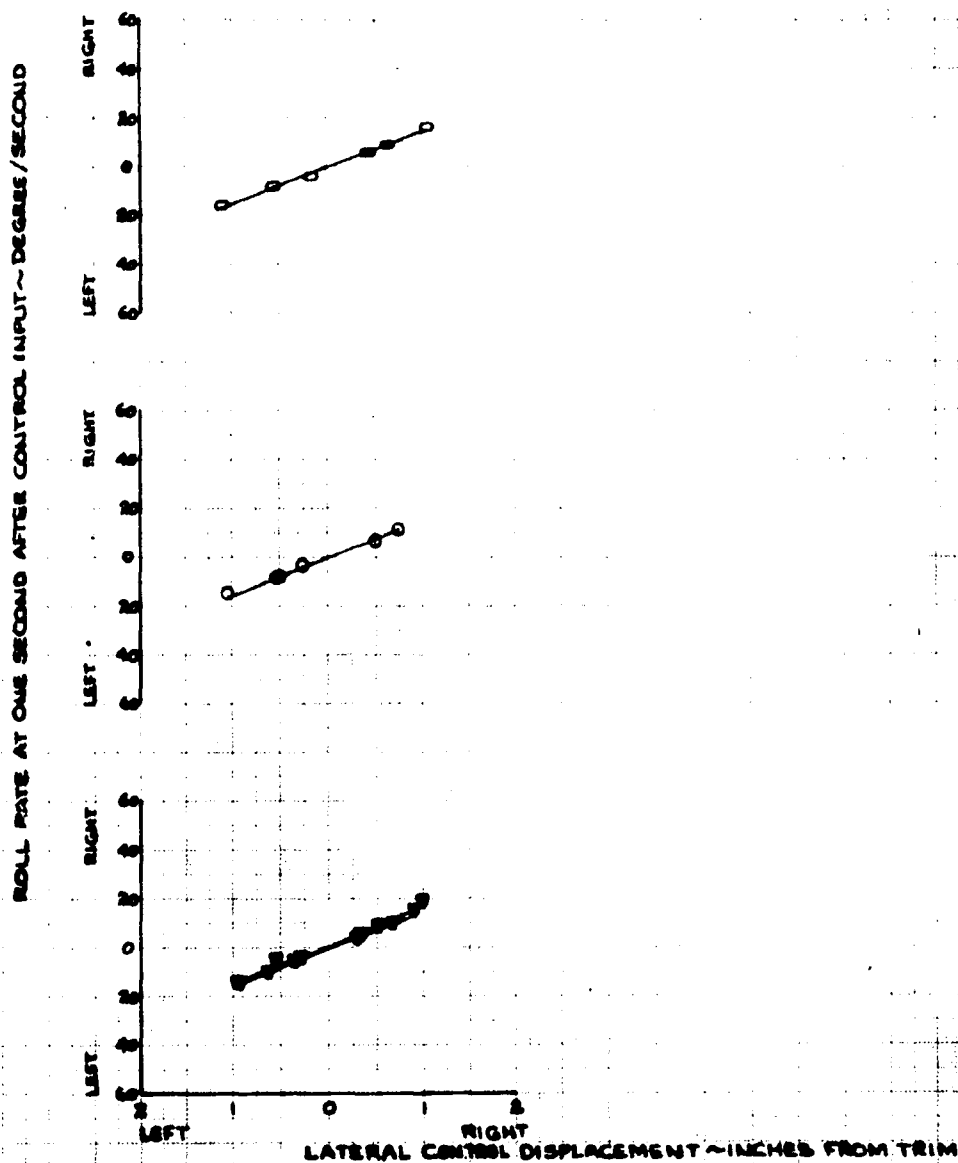


FIGURE NO. 223
ANGULAR ROLL DISPLACEMENT
 AN-10 USAF T13698
 HVT. HOG CONFIGURATION WITH ROCKET POD RAILINGS REMOVED

SYM	AIR SPEED ~ CAS	ANG. ALT. ~ FT.	AVG. G.W. ~ LB.	AVG. LENG. C.G. ~ IN.	WING FLIGHT ~ IN.	WING FLIGHT ~ IN.	WING FLIGHT ~ IN.
200	250	15700	7040	200 (ACT)	2000 LEVEL	FLIGHT	0.00515
200	250	15810	7040	200 (ACT)	2000 LEVEL	FLIGHT	0.00515
200	1050	15840	7150	200 (ACT)	2000 LEVEL	FLIGHT	0.00514

NOTES: OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. ALL ROCKET PODS EMPTY

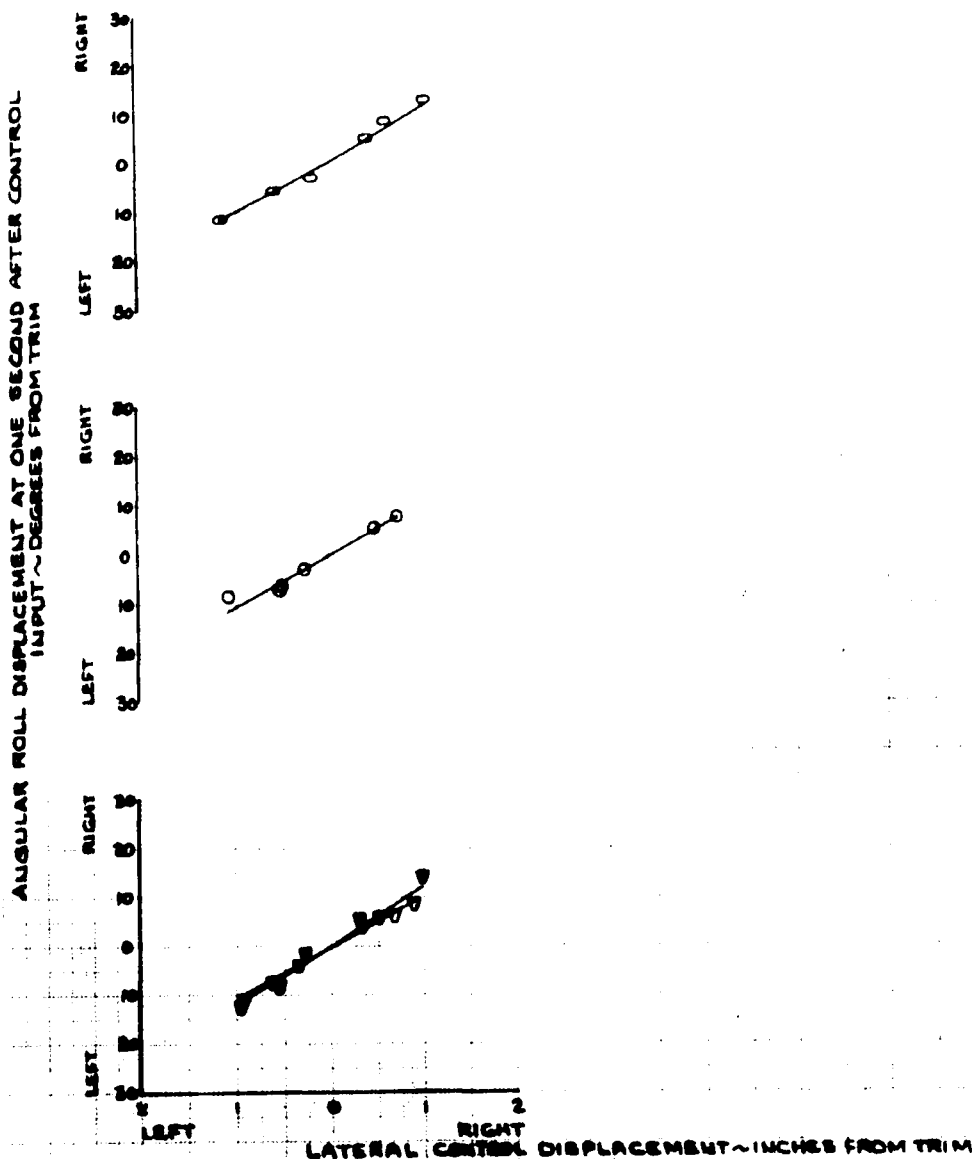


FIGURE NO. 224
DIRECTIONAL CONTROL SENSITIVITY
AH-1G USAF 718615
CLEAN CONFIGURATION

SYM	AIRPEED ~ CAS	Avg. ALT. H ₀ ~ FT.	Avg. G.M. ~ IN.	Avg. Load CG ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C _T
0000	63.0	4970	7710	201.2 (AFT)	3240	LEVEL FLIGHT	0.004439
0000	105.0	6790	7500	201.1 (AFT)	3240	LEVEL FLIGHT	0.004443
0000	145.0	4960	7460	201.2 (AFT)	3230	LEVEL FLIGHT	0.004320
0000	181.0	3140	7700	201.2 (AFT)	3240	DIVE	0.004183
0000	62.0	2140	7620	201.2 (AFT)	3240	CLIMB	0.004066
0000	68.0	3290	7730	201.2 (AFT)	3000	AUTOROTATION	0.004935

NOTE: OPEN SYMBOLS DEMOTE SCAS ON
SOLID SYMBOLS DEMOTE SCAS OFF

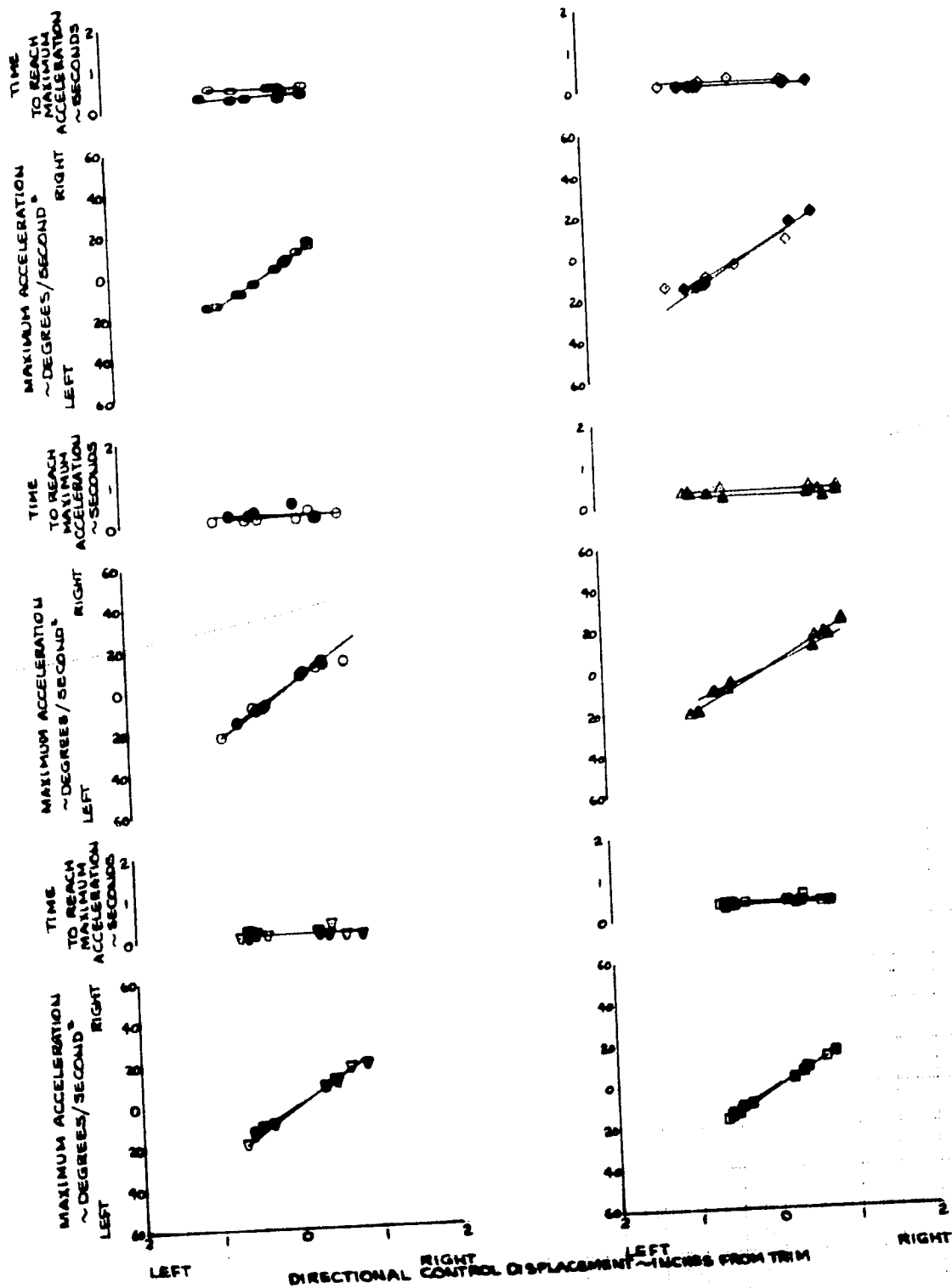


FIGURE NO. 225
DIRECTIONAL CONTROL RESPONSE
 AH-1G USAN715675
 CLEAN CONFIGURATION
 BCAS ON

SYM	AIRSPD ~ CAS	AVG. ALT ~ FT	AVG. G.W. ~ LB	AVE LONG. CG ~ IN.	ROTS FLIGHT RPM	CONDITION	THRST CTRV. ~ CT
○	63.0	4970	7710	201.2 (AP)	3248	LEVEL FLIGHT	0.004434
◇	103.0	4790	7800	201.1 (AP)	3248	LEVEL FLIGHT	0.004451
△	145.0	4600	7460	201.2 (AP)	3248	LEVEL FLIGHT	0.004320
▽	181.0	3140	7100	201.2 (AP)	3248	DIVE	0.004188
□	62.0	2940	7620	201.2 (AP)	3248	CLIMB	0.004064
◇	68.3	3290	7780	201.2 (AP)	3000	AUTOROTATION	0.004986

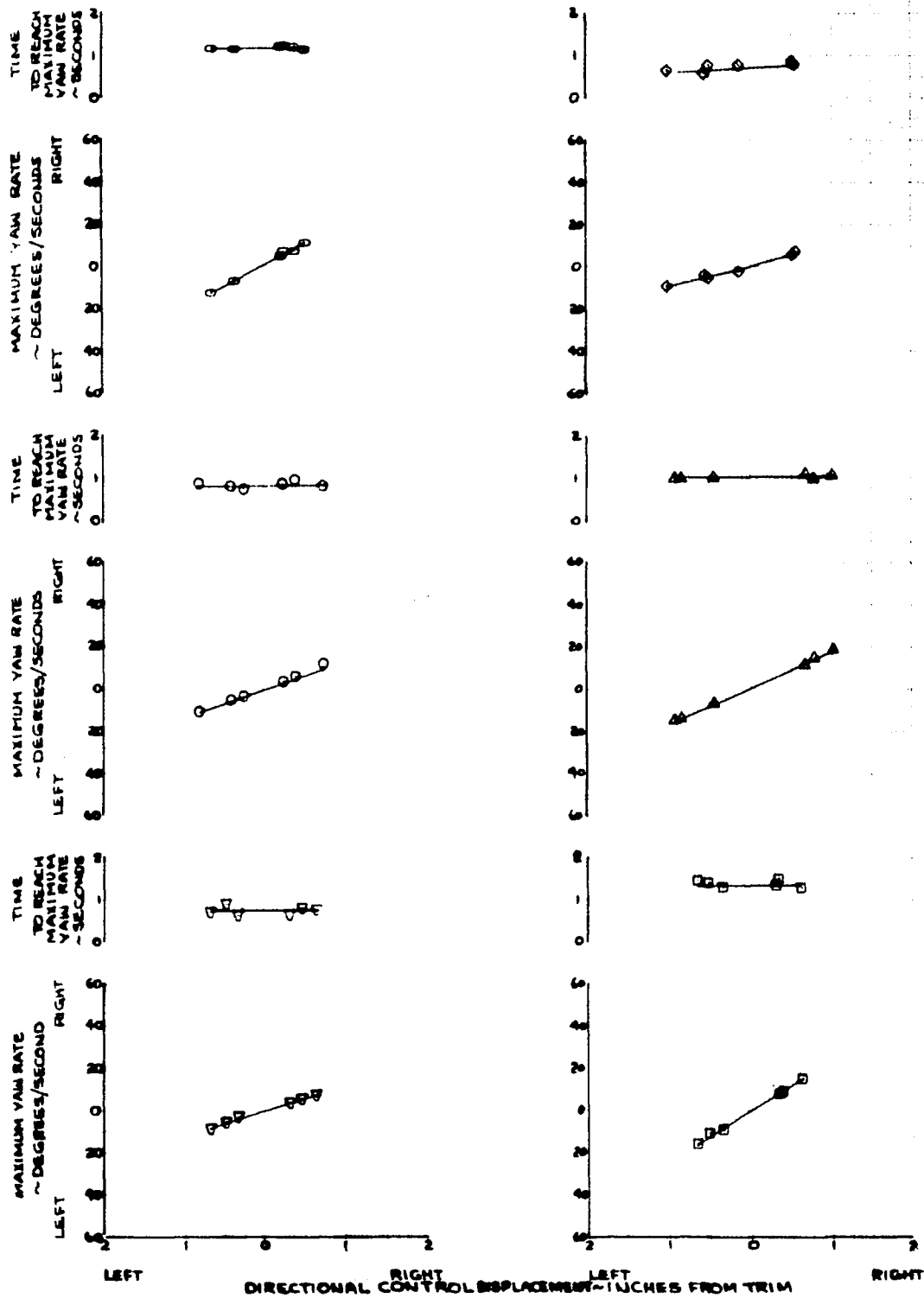


FIGURE NO. 226
DIRECTIONAL RESPONSE AT ONE SECOND
 AH-1G USARV SCAS
 CLEAN CONFIGURATION

SYM	AIR SPEED ~KAS	AVG. ALT. ~FT	AVG. G.M. ~LB	AVG. LONG. C.G. ~IN	ENGINE RPM	FLIGHT CONDITION	THRUST COEFF. ~C _T
○	68.0	4970	7710	201.2 (AFT)	3200	LEVEL FLIGHT	0.004489
●	104.0	4740	7800	201.1 (AFT)	3200	LEVEL FLIGHT	0.004443
◇	145.0	4760	7460	201.2 (AFT)	3200	LEVEL FLIGHT	0.004330
△	181.0	5140	7700	201.2 (AFT)	3200	DIVE	0.004183
△	62.0	2440	7620	201.2 (AFT)	3200	CLIMB	0.004066
□	68.5	5290	7730	201.2 (AFT)	3200	AUTO ROTATION	0.004985

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF

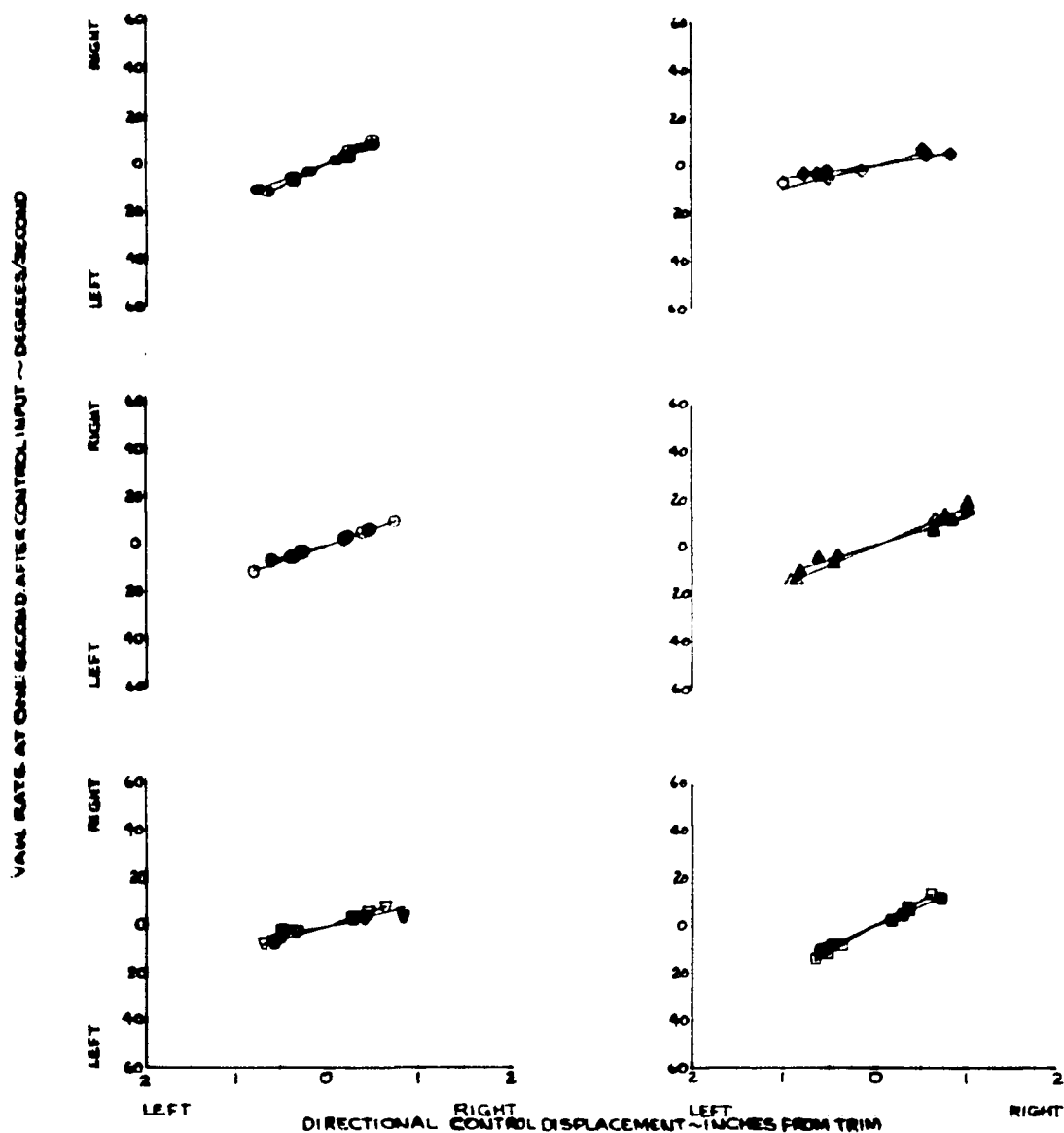


FIGURE NO. 227
ANGULAR YAW DISPLACEMENT
AH-1G USAF 715698
CLEAN CONFIGURATION

SYM	AIR SPEED ~CAS	AVG. ALT. H ₀ ~FT.	AVG. GW. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR FLIGHT CONDITION RPM	THRUST COEFF. ~C _T
8	65.0	4910	7710	201.3(MT)	3240 LEVEL FLIGHT	0.004439
0	104.0	6740	7300	201.1(MT)	3240 LEVEL FLIGHT	0.004443
0	143.0	4940	7400	201.2(MT)	3240 LEVEL FLIGHT	0.004529
0	181.0	5140	7700	201.2(MT)	3240 DIVE	0.004183
4	65.0	2440	7600	201.2(MT)	3240 CLIMB	0.004066
0	65.5	5240	7780	201.2(MT)	3000 AUTO ROTATION	0.004435

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

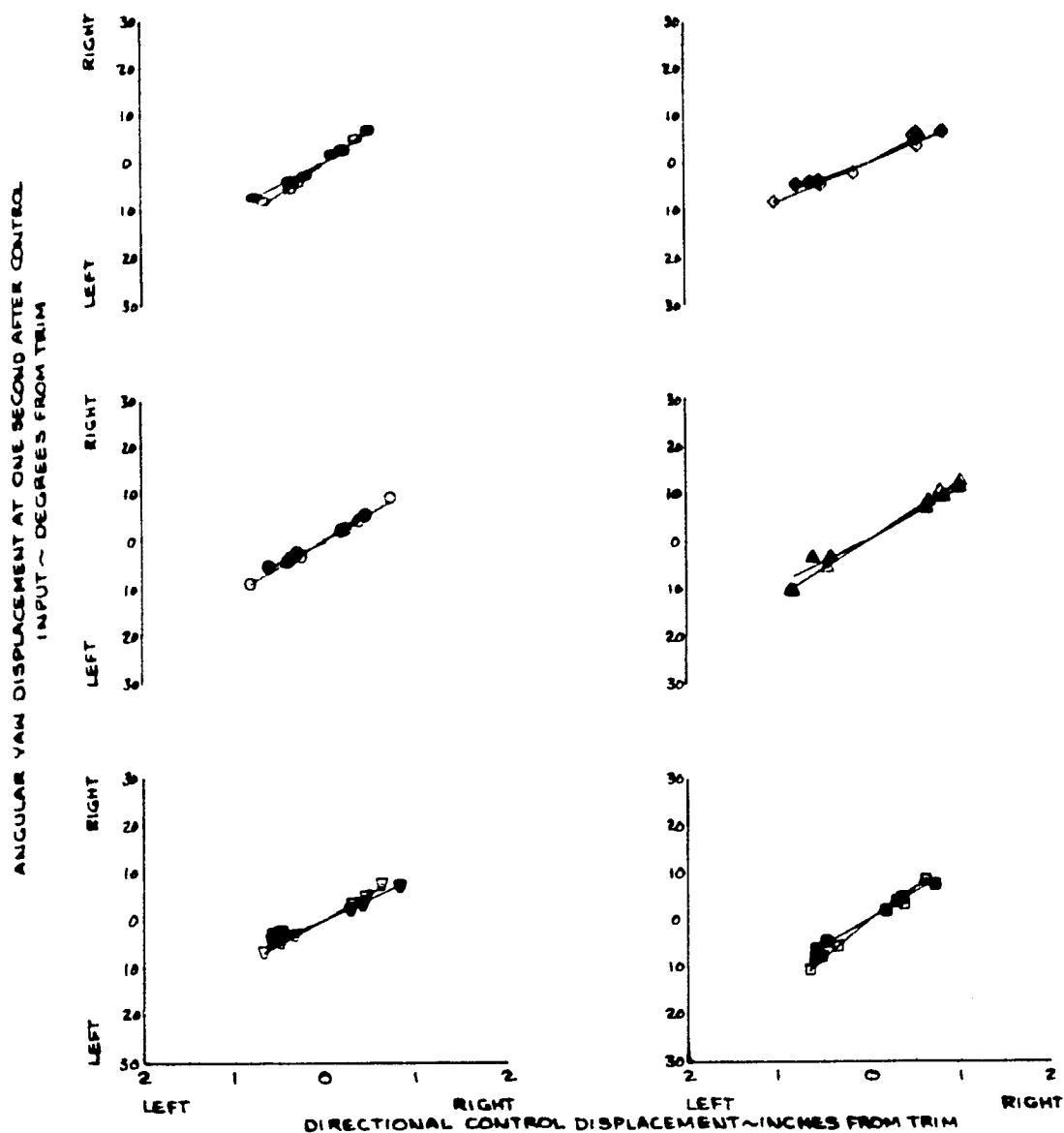


FIGURE No. 228

DIRECTIONAL CONTROL SENSITIVITY

AM-16 USA 445261

CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM	AIR SPEED ~CAS	AVG. ALT. ~FT	AVG. G.H. ~LB	AVG. LONG. C.G. ~IN	ROTOR RPM	FLIGHT COND.	THRUST ~CT	COEFF.
0	1180	3180	8830	149.6 (AF)	3210	LEVEL FLIGHT	0.00	4887
8	1455	4070	8640	149.5 (AF)	3220	LEVEL FLIGHT	0.00	4929
0	1690	5780	8540	149.5 (AF)	3220	DIVE	0.00	5103

NOTE: OPEN SYMBOLS DENOTE SCAR ON
SOLID SYMBOLS DENOTE SCAR OFF

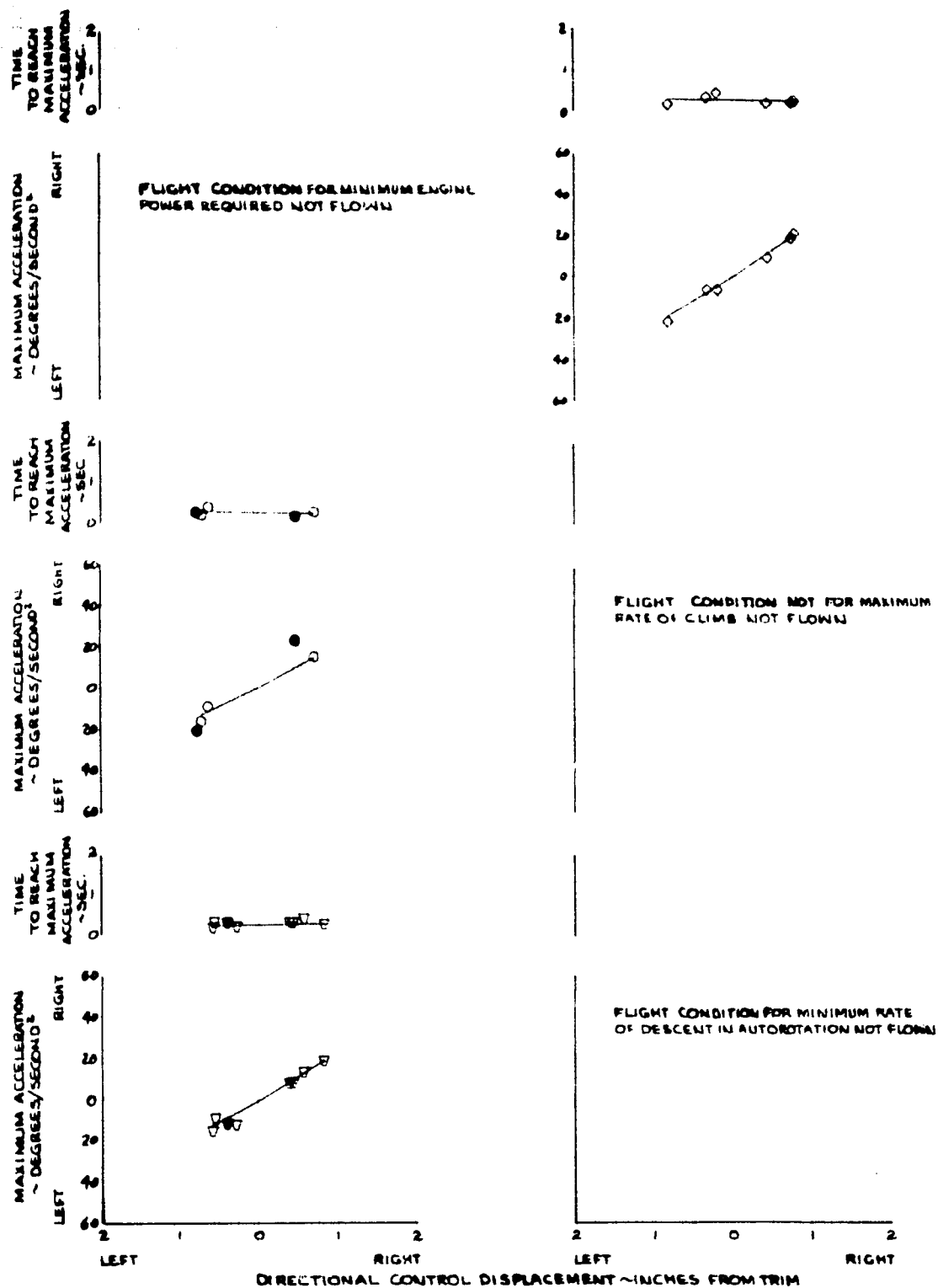


FIGURE No. 229
DIRECTIONAL CONTROL RESPONSE

AM-1G USA 4681887
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM.	AIR SPEED ~CAS	AVG. ALT. ~FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
○	118.0	3150	8820	198.6 (AFT)	3250	LEVEL FLIGHT	0.004837
○	145.5	4070	8690	199.5 (AFT)	3220	LEVEL FLIGHT	0.004424
○	169.0	5780	8540	199.5 (AFT)	3220	DIVE	0.005103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

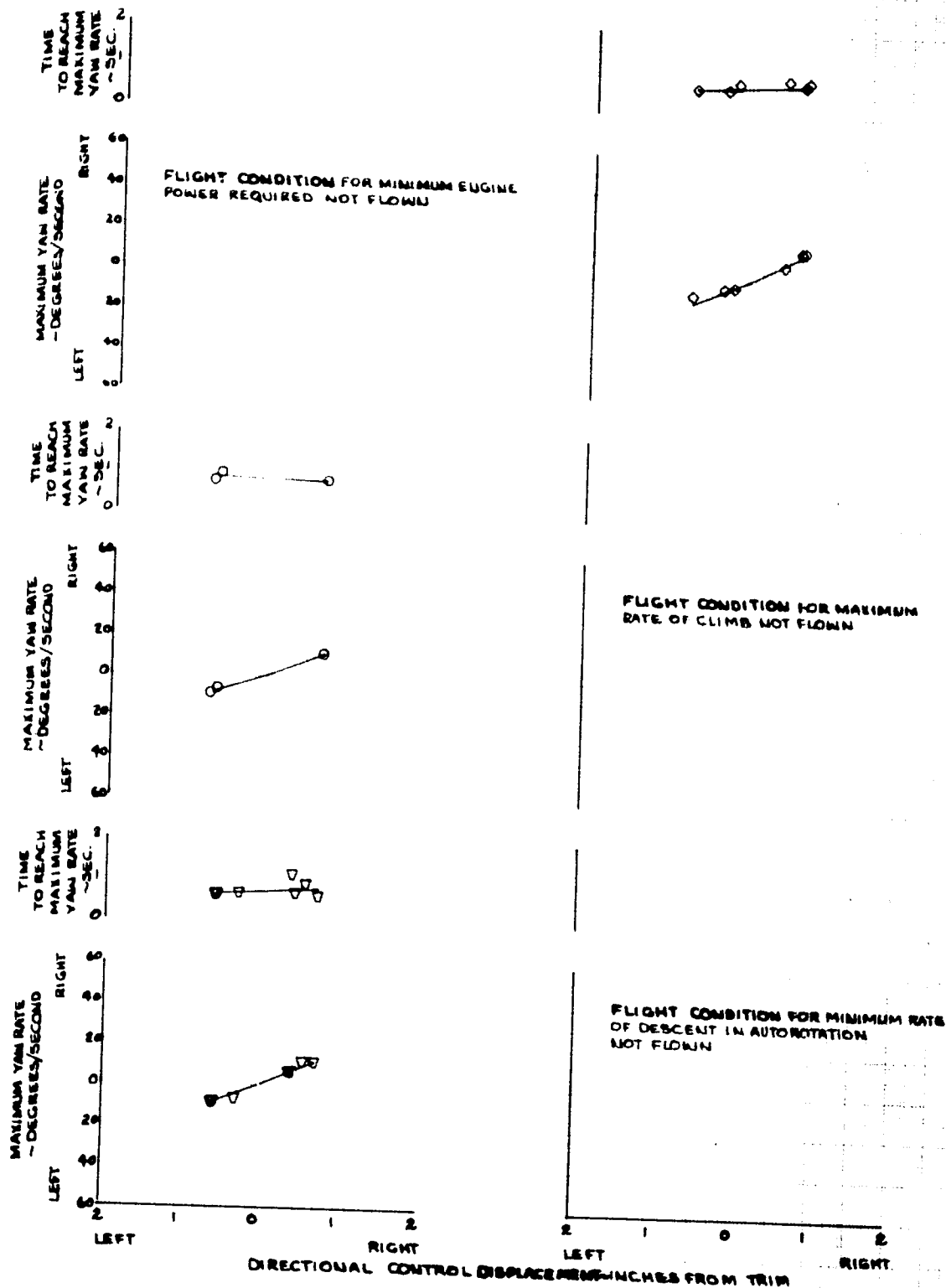


FIGURE NO. 230 DIRECTIONAL RESPONSE AT ONE SECOND

AN-16 USA 2410001
CLEAN CONFIGURATION WITH LANDING GEAR CROSS TUBE FAIRINGS REMOVED

SYM.	AIR SPEED ~KTS	AIR ALT. ~FT.	AIR G.M. ~LB	AIR LONG. ~IN.	WIND KTS	FLIGHT COND.	THRUST COEFF. ~C _T
0	118.0	3150	8820	149.6(57)	222.0	LEVEL FLIGHT	0.004857
0	145.5	4070	8690	149.5(57)	222.0	LEVEL FLIGHT	0.004924
0	169.0	5180	8540	149.5(57)	222.0	DIVE	0.005103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

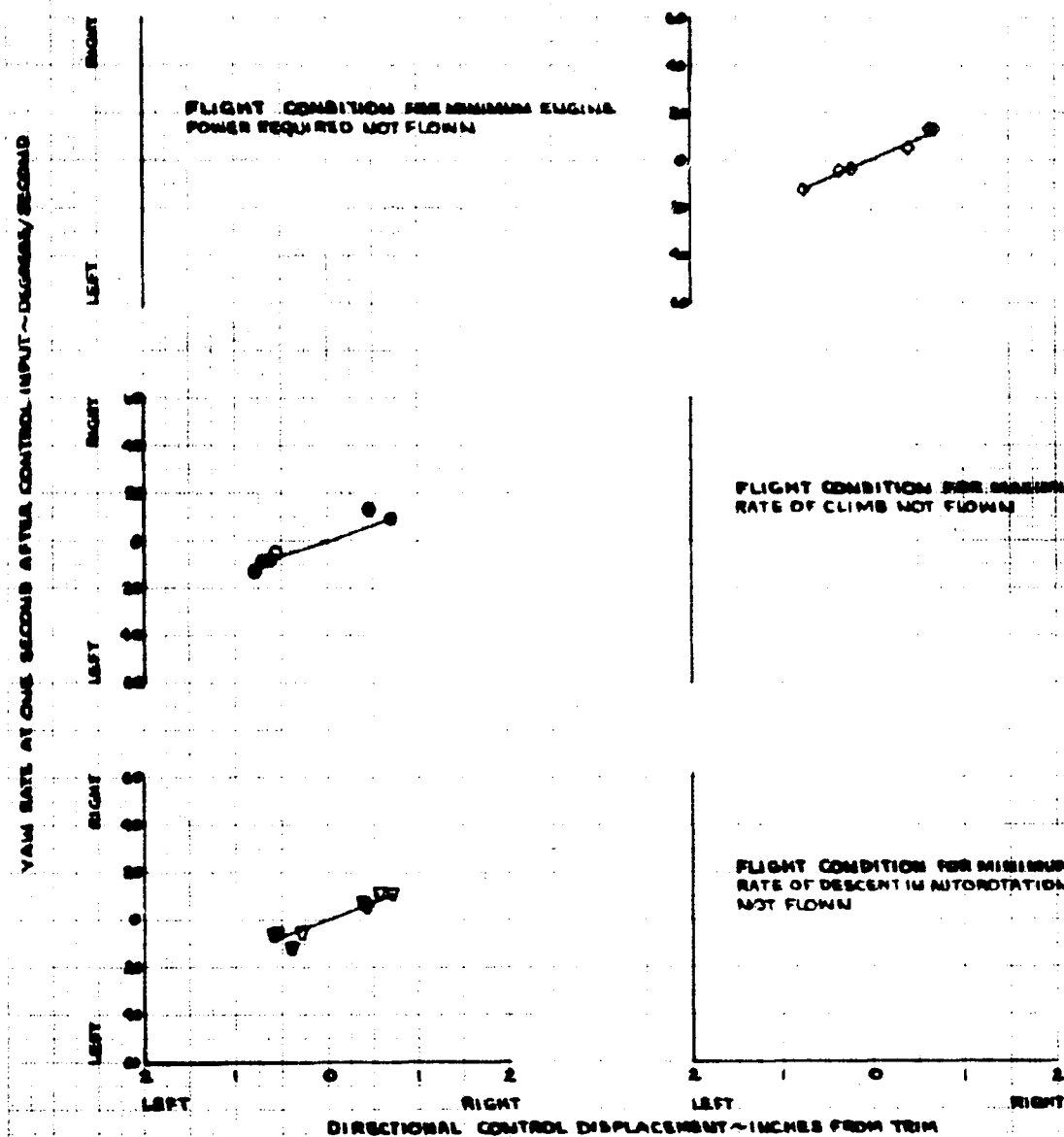


FIGURE No. 251 ANGULAR YAW DISPLACEMENT

AM-16 USA 64M5003
CLEAN CONFIGURATION WITH LAUNCHING GEAR CROSS TUBES FAIRINGS REMOVED

SYM	AIRSPED ~CAS	AVE. ALT ~FT.	AVE. GM ~LB.	AVE. LWB C.G. ~IN.	ENGINE RPM	FLIGHT COND.	THRUST COEFF. ~C _T
000	148.0	3150	8820	176.5(AFT)	3320	LEVEL FLIGHT	0.004837
000	166.5	4870	8590	176.5(AFT)	3320	LEVEL FLIGHT	0.004984
000	161.0	5780	8540	176.5(AFT)	3320	DIVE	0.005103

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF

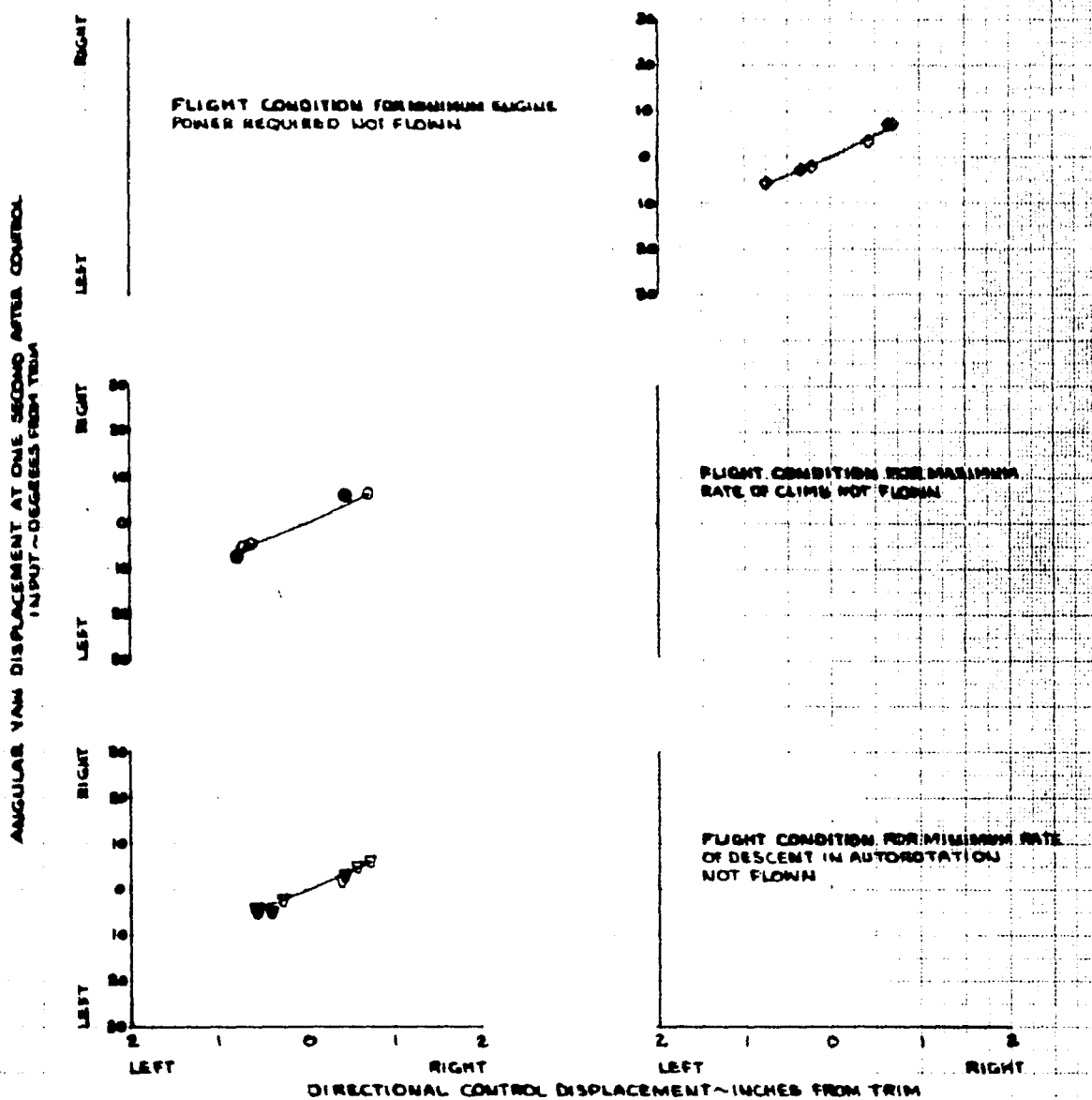
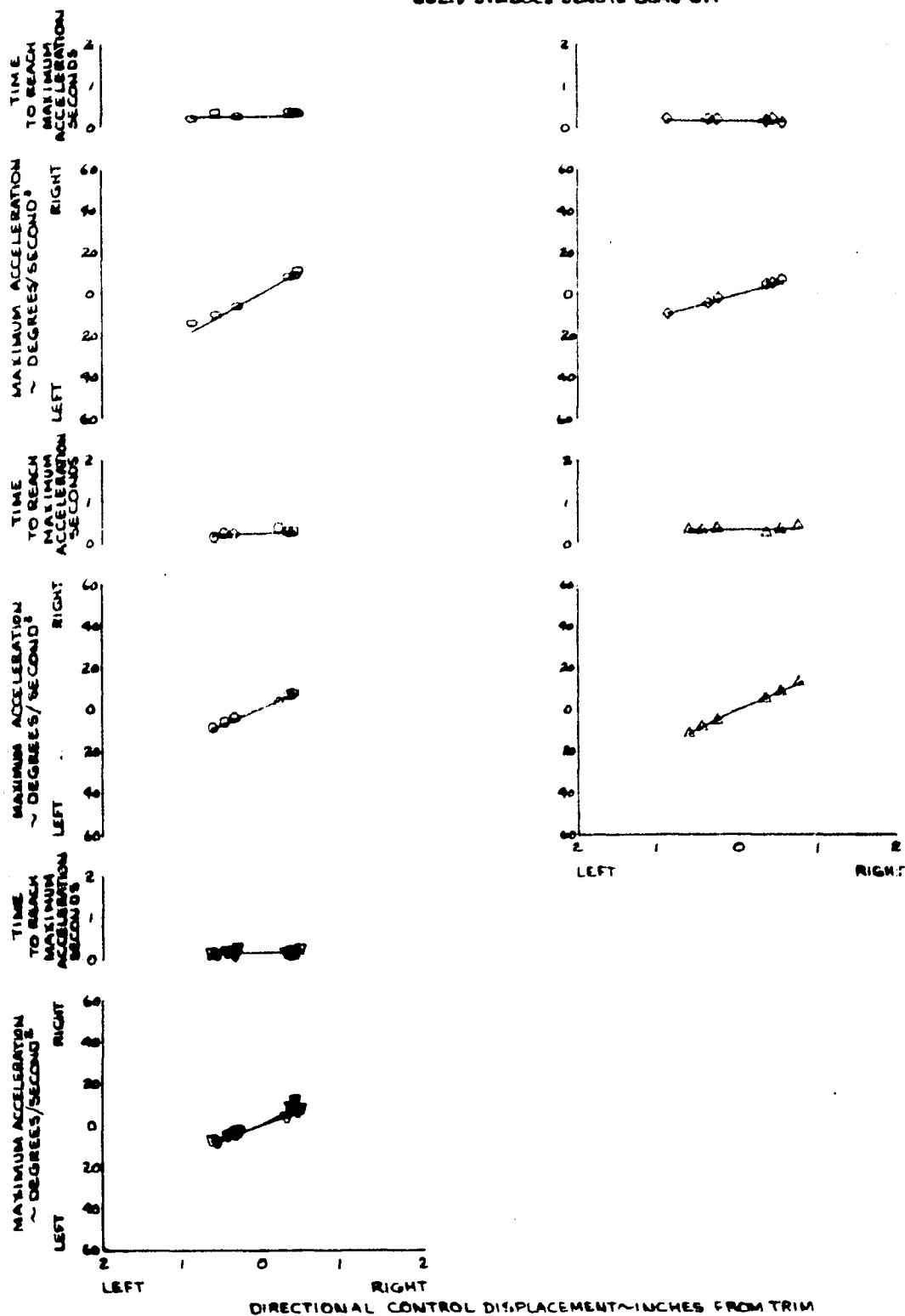


FIGURE No. 232 DIRECTIONAL CONTROL SENSITIVITY

AM-1G USA #718695
HVV HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~CAS	AVG ALT ~FT	AVG G.N. ~LB	AVG LONG. C.G. ~IN.	ROTOR FLIGHT RPM	CONDITION	THRUST COEFF. ~C _T
0	630	4800	9540	200.0(AFT)	324.0	LEVEL FLIGHT	0.00 5464
0	1080	5300	9280	200.2(AFT)	324.0	LEVEL FLIGHT	0.00 5396
0	1340	6440	8920	300.0(AFT)	324.0	LEVEL FLIGHT	0.00 5454
0	1720	6870	9250	199.6(AFT)	324.0	DIVE	0.00 5643
0	630	6380	9420	199.6(AFT)	324.0	CLIMB	0.00 5661

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF



DIRECTIONAL CONTROL RESPONSE

AN-4 USA 471864
HYL HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAB ON

SYM	AIR SPEED	ANG. ALT.	ANG. S.M.	Avg. WIND	WIND	FLIGHT CONDITION	THRUST	COEFF.
	-CAS	H ₂ -FT.	°-L	C.G. -18	MPH			
00	150.0	4500	9120	200.0 (MPH)	224.0	LEVEL FLIGHT	0.00	0.565
00	150.0	5000	9120	200.0 (MPH)	224.0	LEVEL FLIGHT	0.00	0.565
00	150.0	5400	9120	200.0 (MPH)	224.0	LEVEL FLIGHT	0.00	0.565
00	172.0	6000	9240	190.0 (MPH)	224.0	DIVE	0.00	0.565
00	620	6300	9400	190.0 (MPH)	224.0	CLIMB	0.00	0.565

NOTE: ALL ROCKET PODS FULLY LOADED (C-24-L)

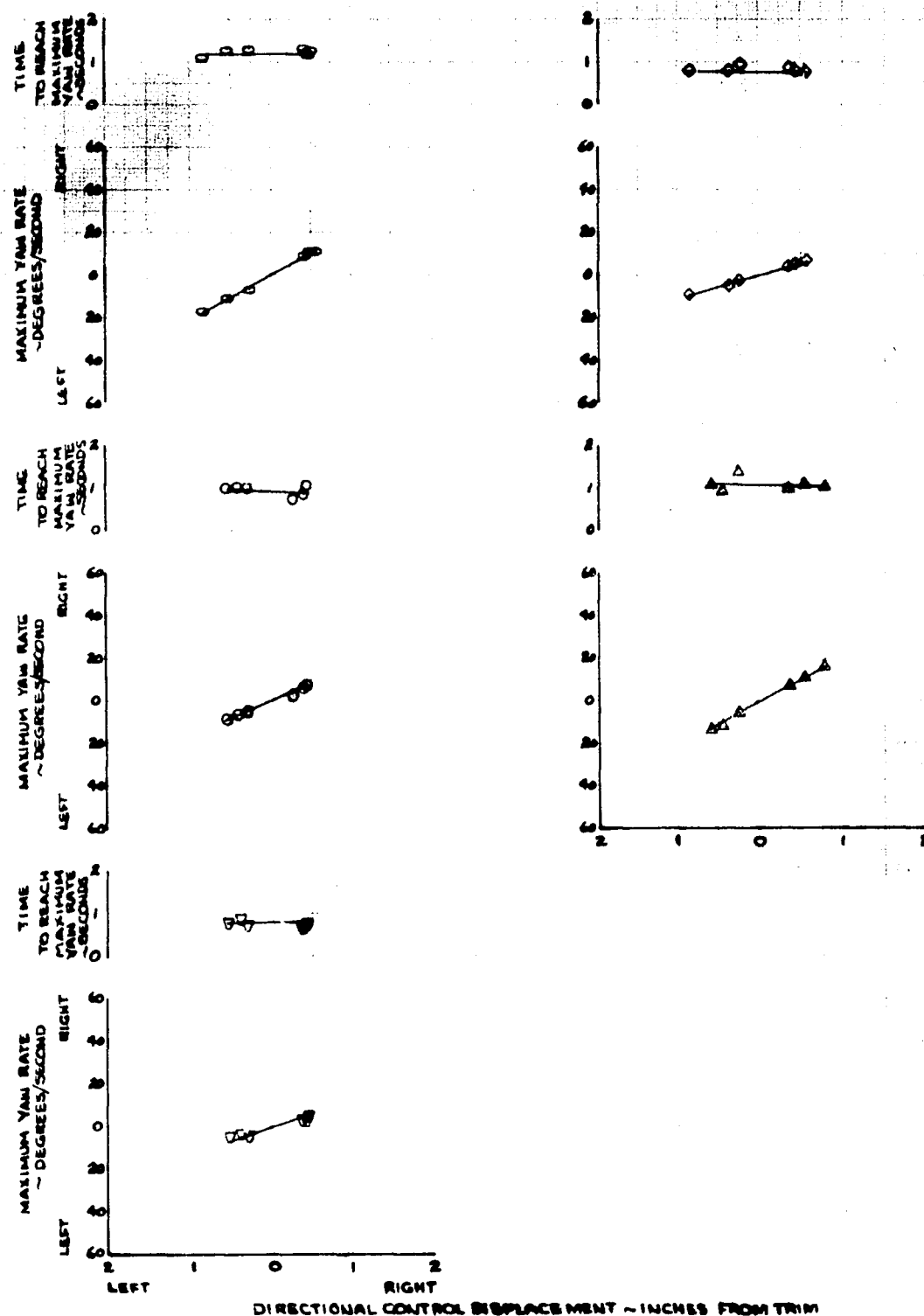


FIGURE No. 234
DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USAF 715693
 HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~KTS	AVG. ALT. ~FT.	AVG. S.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~CT
0000	68.0	4800	9800	205.0 (AFT)	3240	LEVEL FLIGHT	0.005465
0000	108.0	3800	9300	200.5 (AFT)	3240	LEVEL FLIGHT	0.005897
0000	134.0	6940	8420	200.0 (AFT)	3240	LEVEL FLIGHT	0.005450
0000	172.0	6870	9250	199.4 (AFT)	3240	DIVE	0.005643
0000	62.0	6300	9420	199.6 (AFT)	3240	CLIMB	0.005661

NOTE: OPEN SYMBOLS DENOTE SCAS ON
 SOLID SYMBOLS DENOTE SCAS OFF
 ALL ROCKET PODS FULLY LOADED (1634 LB)

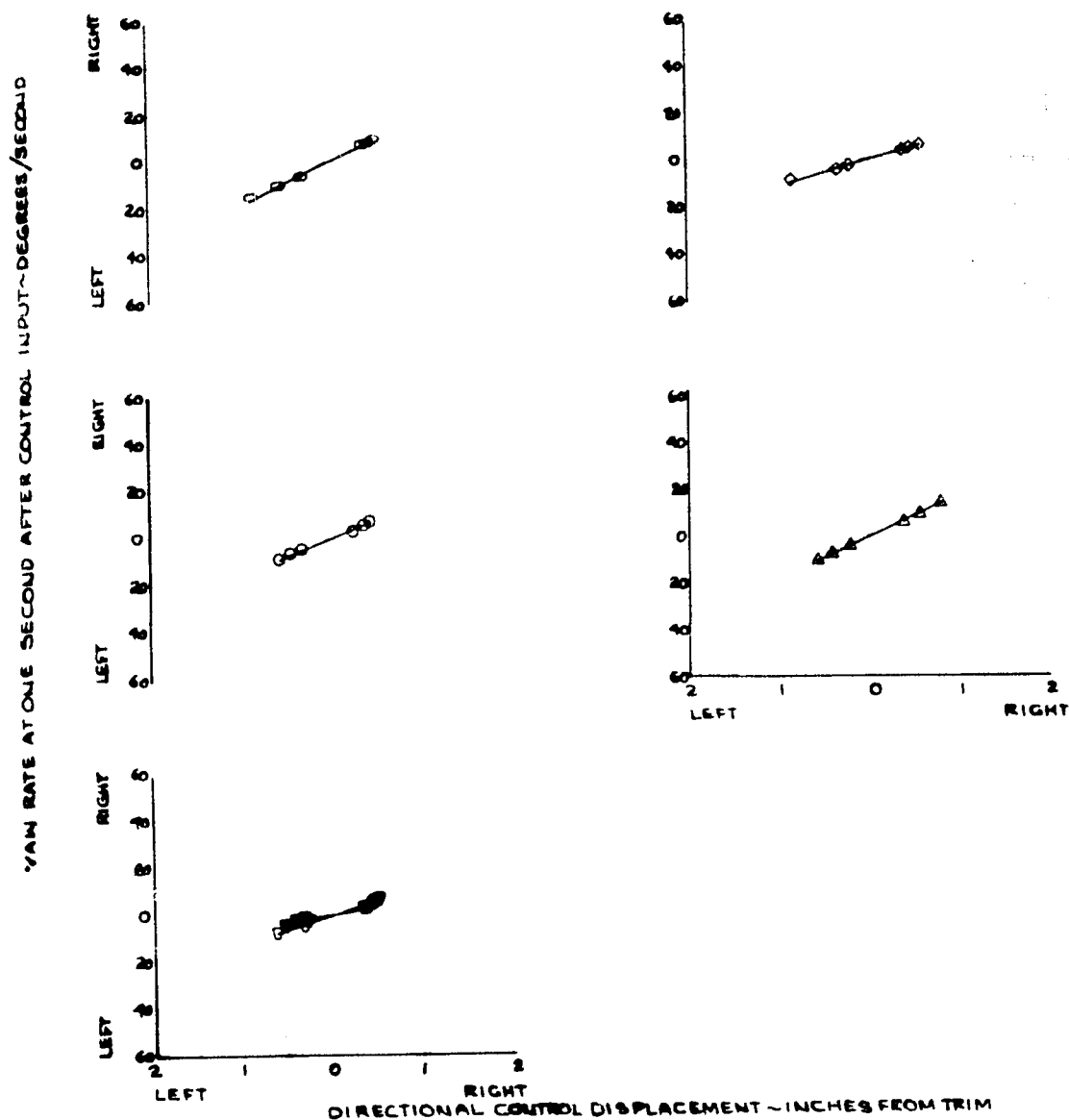
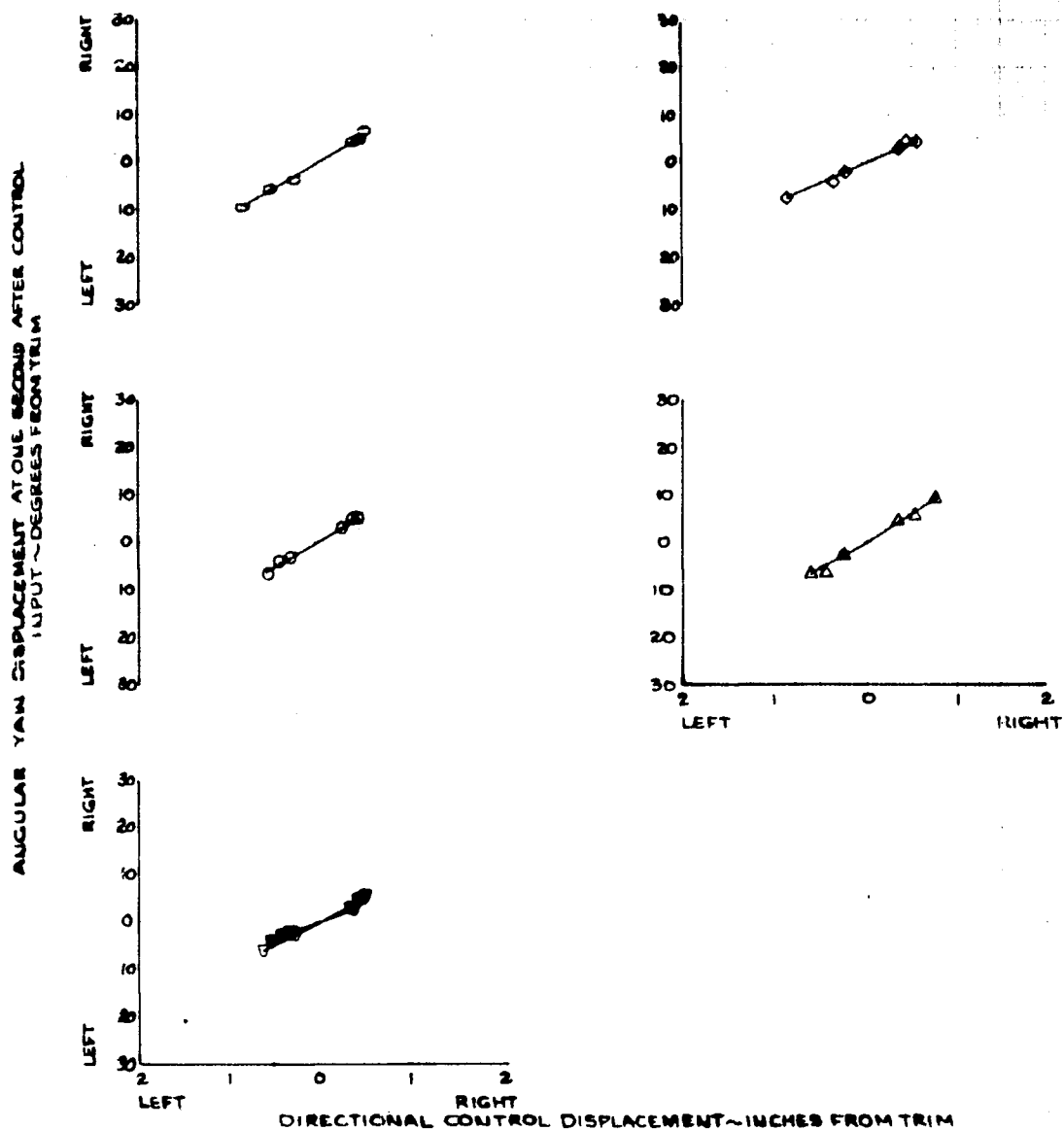


FIGURE No. 235 ANGULAR YAW DISPLACEMENT

AN-10 USAF TIGER
HVV. HOG CONFIGURATION WITH BUCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	AVE. ALT ~ FT	AVE. G.W. ~ LB.	AVE. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ CT
●	62.0	4800	9240	300.0 (AF)	3240	LEVEL FLIGHT	0.005444
○	102.0	5200	9280	200.0 (AF)	3240	LEVEL FLIGHT	0.005892
○	126.0	6140	8720	200.0 (AF)	3240	LEVEL FLIGHT	0.005454
○	172.0	6810	9260	199.6 (MT)	3240	DIVE	0.005648
▲	62.0	6380	9420	199.6 (MT)	3240	CLIMB	0.005661

NOTES: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
BALL ROCKET PODS FULLY LOADED



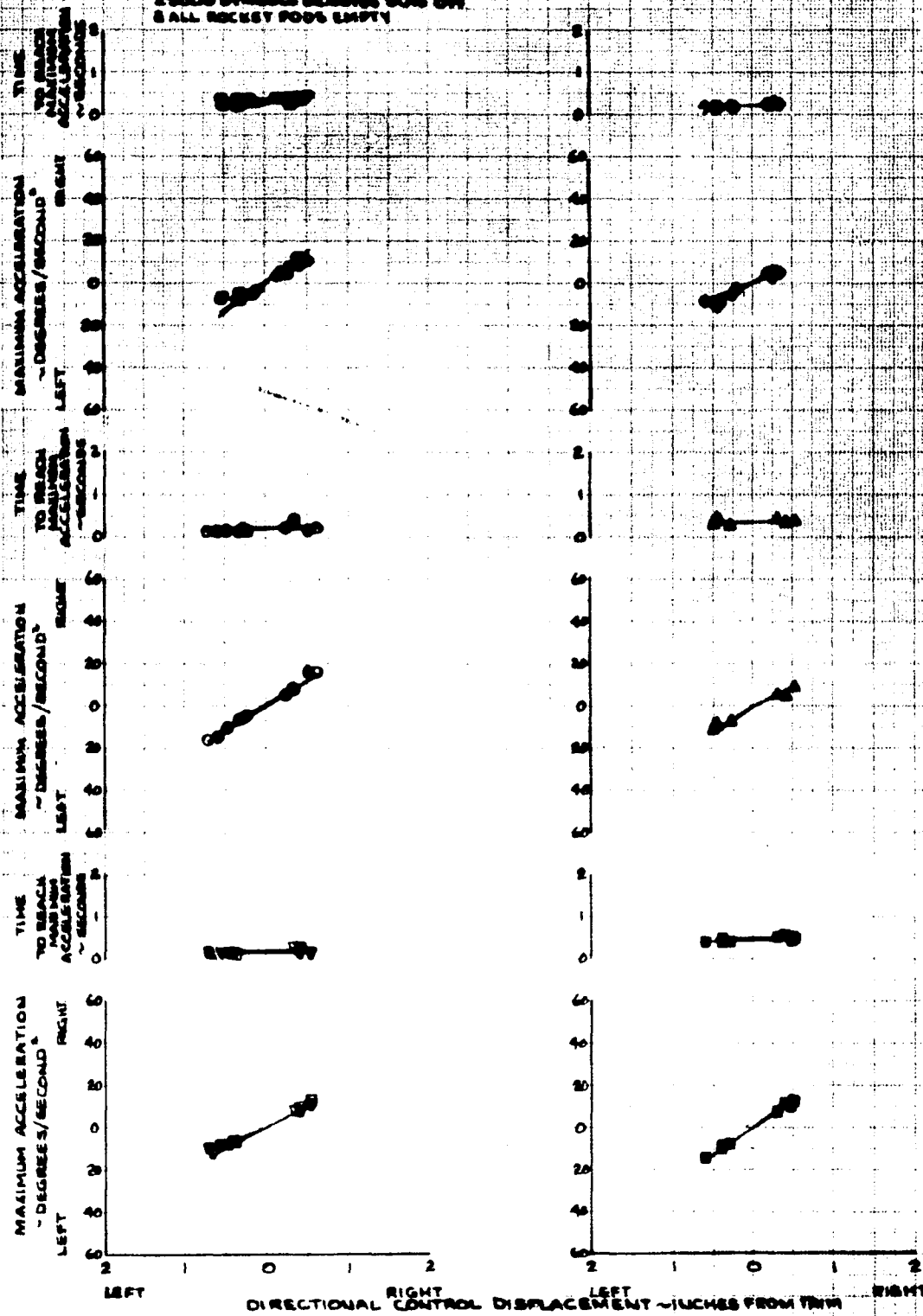
DIRECTIONAL CONTROL SENSITIVITY

AM-16 USAF 16098

MOV. NOG CONFIGURATION WITH RELEASE PERFORMING, REMOVED

SYM	AIRGROSS	AIR ALT	BAR. S.M.	ANG. LONG	TIME	REMARKS	WIND	TEMP	GROUP
	~ 645	~ 300	~ 65	CA 1000					
00000000	580	280	700	200 (CA 1000)	1120	LEVEL FLIGHT	0000	2411	
	1520	510	1000	200 (CA 1000)	3120	LEVEL FLIGHT	0000	4121	
	1720	600	1000	200 (CA 1000)	3120	DIVE	0000	4121	
	600	1000	1000	200 (CA 1000)	3120	CLIMB	0000	4122	
	670	3700	1200	200 (CA 1000)	3120	AUTODISTON	0000	4122	

NOTE: LOSEN SYMBOLS REMOVED REAR ON
2 SOLD SYMBOLS REMOVED REAR OFF
8 ALL ROCKET PODS EMPTY



DIRECTIONAL CONTROL DISPLACEMENT INCHES FROM TRIP

DATA	ACCELERATION	AVG ALT	AVG CL	AVG LING	ENGINE	SLIGHT DEVIATION	THRUST COEFF.
0	0.0	0.00	0.00	0.00	0.00	LEVEL FLIGHT	0.00
1	0.1	0.01	0.01	0.01	0.01	LEVEL FLIGHT	0.01
2	0.2	0.02	0.02	0.02	0.02	LEVEL FLIGHT	0.02
3	0.3	0.03	0.03	0.03	0.03	LEVEL FLIGHT	0.03
4	0.4	0.04	0.04	0.04	0.04	LEVEL FLIGHT	0.04
5	0.5	0.05	0.05	0.05	0.05	LEVEL FLIGHT	0.05
6	0.6	0.06	0.06	0.06	0.06	LEVEL FLIGHT	0.06
7	0.7	0.07	0.07	0.07	0.07	LEVEL FLIGHT	0.07
8	0.8	0.08	0.08	0.08	0.08	LEVEL FLIGHT	0.08
9	0.9	0.09	0.09	0.09	0.09	LEVEL FLIGHT	0.09
10	1.0	0.10	0.10	0.10	0.10	LEVEL FLIGHT	0.10
11	1.1	0.11	0.11	0.11	0.11	LEVEL FLIGHT	0.11
12	1.2	0.12	0.12	0.12	0.12	LEVEL FLIGHT	0.12
13	1.3	0.13	0.13	0.13	0.13	LEVEL FLIGHT	0.13
14	1.4	0.14	0.14	0.14	0.14	LEVEL FLIGHT	0.14
15	1.5	0.15	0.15	0.15	0.15	LEVEL FLIGHT	0.15
16	1.6	0.16	0.16	0.16	0.16	LEVEL FLIGHT	0.16
17	1.7	0.17	0.17	0.17	0.17	LEVEL FLIGHT	0.17
18	1.8	0.18	0.18	0.18	0.18	LEVEL FLIGHT	0.18
19	1.9	0.19	0.19	0.19	0.19	LEVEL FLIGHT	0.19
20	2.0	0.20	0.20	0.20	0.20	LEVEL FLIGHT	0.20
21	2.1	0.21	0.21	0.21	0.21	LEVEL FLIGHT	0.21
22	2.2	0.22	0.22	0.22	0.22	LEVEL FLIGHT	0.22
23	2.3	0.23	0.23	0.23	0.23	LEVEL FLIGHT	0.23
24	2.4	0.24	0.24	0.24	0.24	LEVEL FLIGHT	0.24
25	2.5	0.25	0.25	0.25	0.25	LEVEL FLIGHT	0.25
26	2.6	0.26	0.26	0.26	0.26	LEVEL FLIGHT	0.26
27	2.7	0.27	0.27	0.27	0.27	LEVEL FLIGHT	0.27
28	2.8	0.28	0.28	0.28	0.28	LEVEL FLIGHT	0.28
29	2.9	0.29	0.29	0.29	0.29	LEVEL FLIGHT	0.29
30	3.0	0.30	0.30	0.30	0.30	LEVEL FLIGHT	0.30
31	3.1	0.31	0.31	0.31	0.31	LEVEL FLIGHT	0.31
32	3.2	0.32	0.32	0.32	0.32	LEVEL FLIGHT	0.32
33	3.3	0.33	0.33	0.33	0.33	LEVEL FLIGHT	0.33
34	3.4	0.34	0.34	0.34	0.34	LEVEL FLIGHT	0.34
35	3.5	0.35	0.35	0.35	0.35	LEVEL FLIGHT	0.35
36	3.6	0.36	0.36	0.36	0.36	LEVEL FLIGHT	0.36
37	3.7	0.37	0.37	0.37	0.37	LEVEL FLIGHT	0.37
38	3.8	0.38	0.38	0.38	0.38	LEVEL FLIGHT	0.38
39	3.9	0.39	0.39	0.39	0.39	LEVEL FLIGHT	0.39
40	4.0	0.40	0.40	0.40	0.40	LEVEL FLIGHT	0.40
41	4.1	0.41	0.41	0.41	0.41	LEVEL FLIGHT	0.41
42	4.2	0.42	0.42	0.42	0.42	LEVEL FLIGHT	0.42
43	4.3	0.43	0.43	0.43	0.43	LEVEL FLIGHT	0.43
44	4.4	0.44	0.44	0.44	0.44	LEVEL FLIGHT	0.44
45	4.5	0.45	0.45	0.45	0.45	LEVEL FLIGHT	0.45
46	4.6	0.46	0.46	0.46	0.46	LEVEL FLIGHT	0.46
47	4.7	0.47	0.47	0.47	0.47	LEVEL FLIGHT	0.47
48	4.8	0.48</					



FIGURE NO. 238 DIRECTIONAL RESPONSE AT ONE SECOND

AH-1G USAF 1968
HVV HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	Avg. ALT. H ₀ ~ FT.	Avg. G.M. ~ LB.	Avg. L.O.M. C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C _T
○	61.0	4250	7880	288.8 (AFT)	3248	LEVEL FLIGHT	0.00 4422
●	108.0	3880	7440	288.8 (AFT)	3248	LEVEL FLIGHT	0.00 4422
○	153.5	5140	7860	288.8 (AFT)	3248	LEVEL FLIGHT	0.00 4422
○	172.0	6860	7880	288.8 (AFT)	3250	DIVE	0.00 4422
△	60.0	4080	7830	288.8 (AFT)	3248	CLIMB	0.00 4422
□	67.0	2700	7600	288.8 (AFT)	3110	AUTOROTATION	0.00 4422

NOTES: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS EMPTY

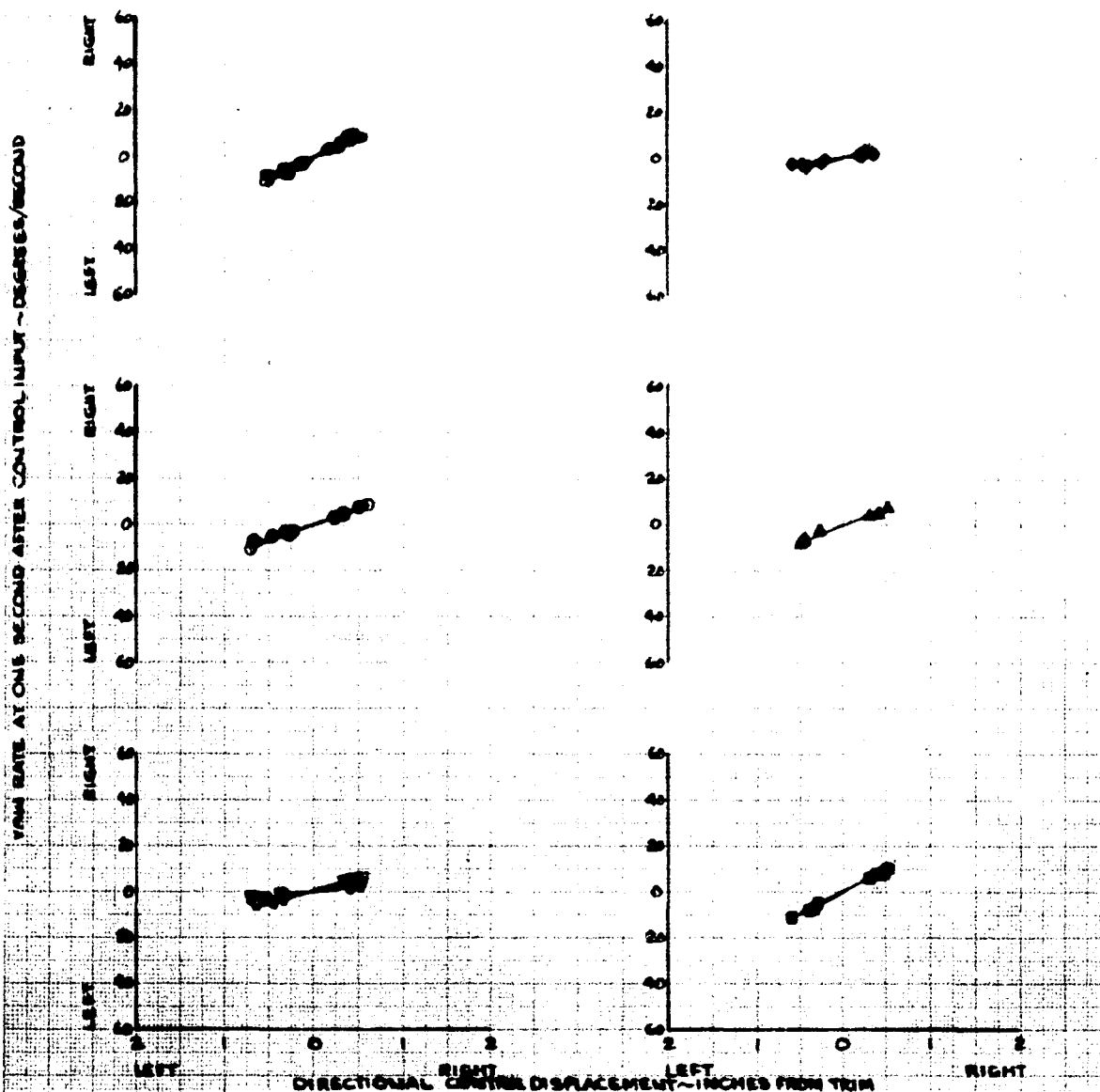


FIGURE No. 239
ANGULAR VAN DISPLACEMENT

AH-1G USAF 15685
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED	HEALT	ANG. ALT.	ANG. LNK.	ROTOR	FLIGHT	THROTTLE
000000	120	1200	1200	1200	1200	LEVEL FLIGHT	0.004411
	120	1200	1200	1200	1200	LEVEL FLIGHT	0.004411
	120	1200	1200	1200	1200	LEVEL FLIGHT	0.004411
	120	1200	1200	1200	1200	DIVE	0.004411
	120	1200	1200	1200	1200	CLIMB	0.004411
	120	1200	1200	1200	1200	AUTOROTATION	0.004411

NOTE: OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
BALL ROCKET PODS EMPTY

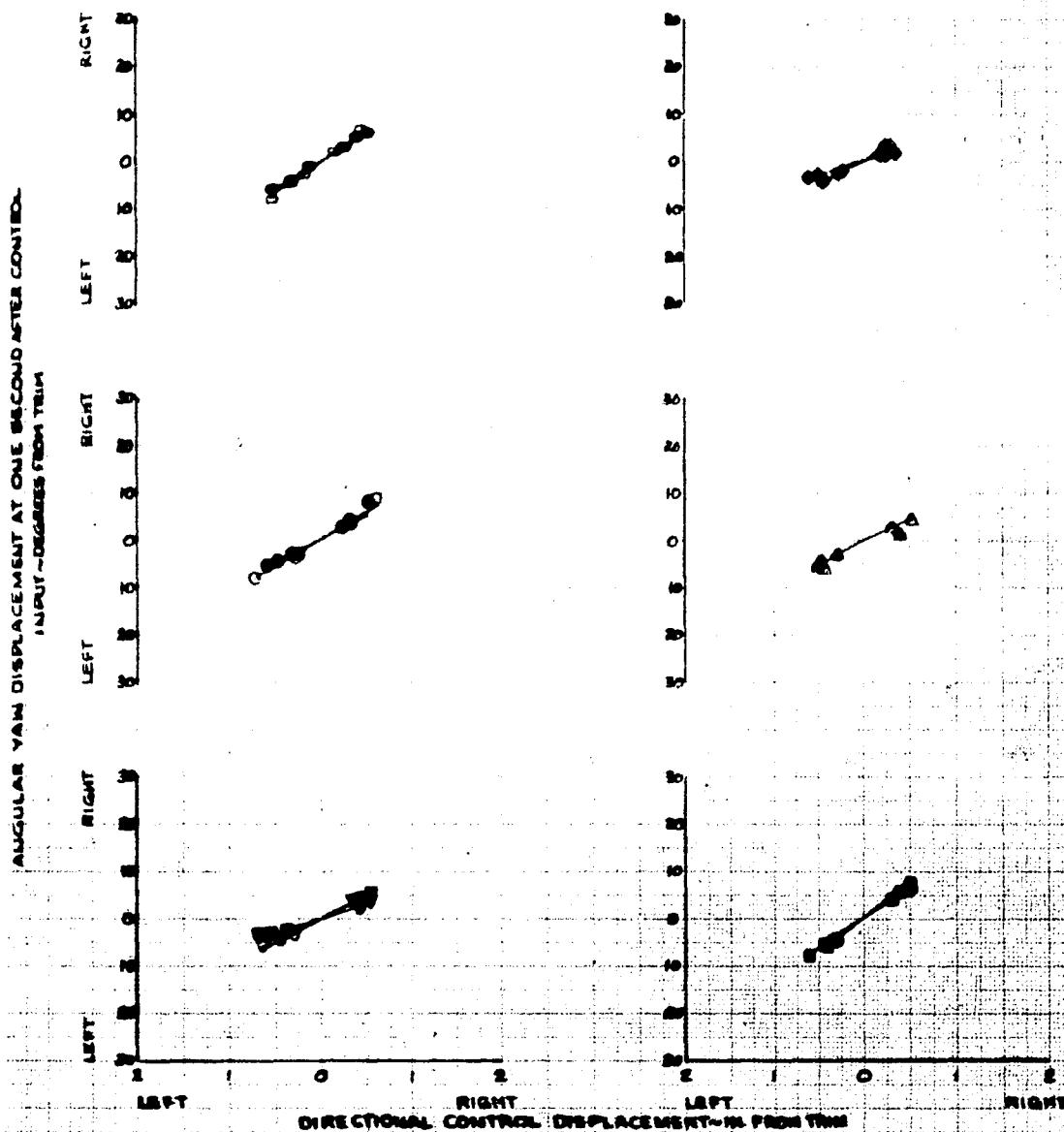
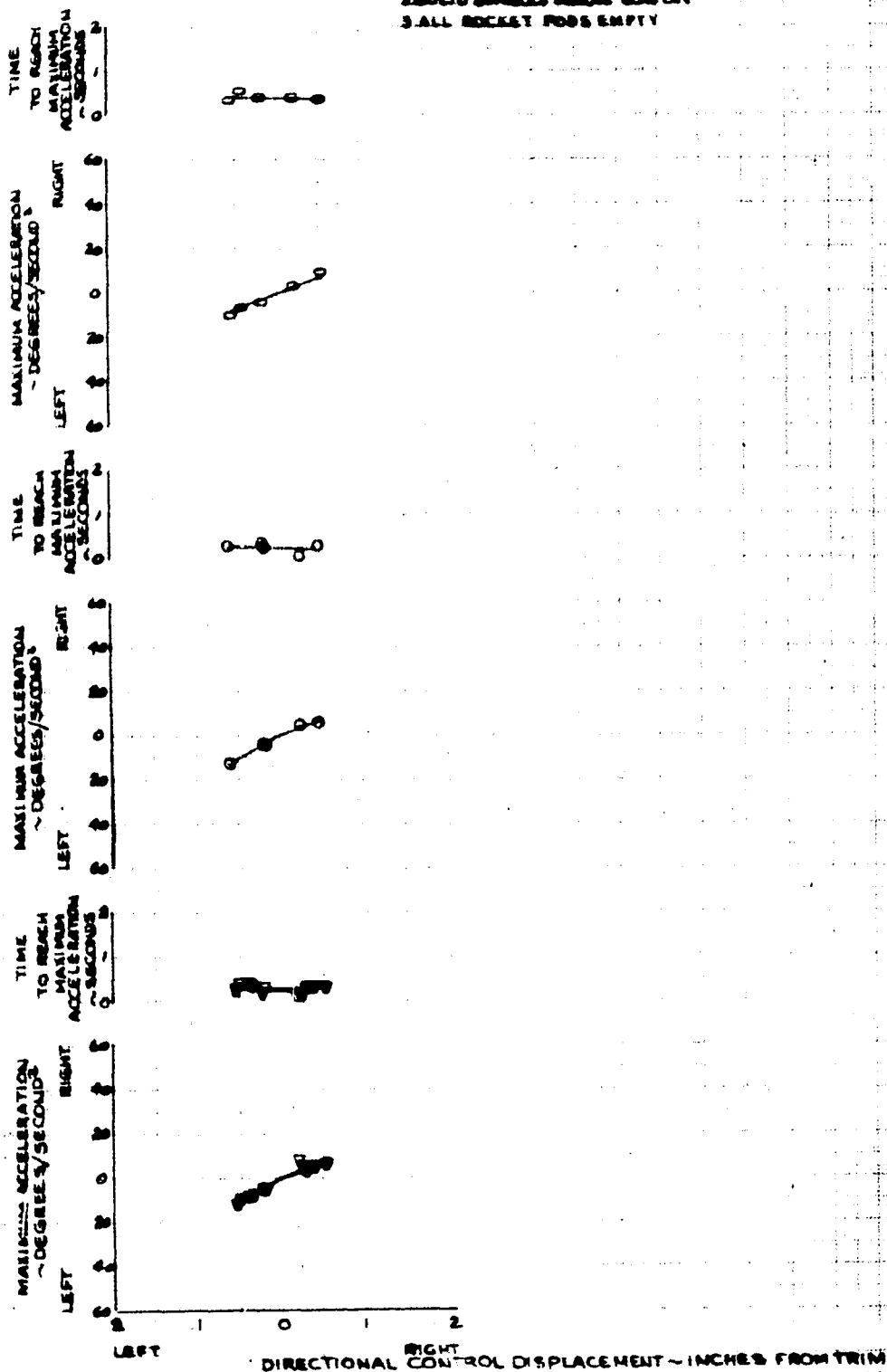


FIGURE NO 240
DIRECTIONAL CONTROL SENSITIVITY
AH-1G USA 6218498

MYT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIRSPD ~ CAS	AUG. ALT H ₀ ~ FT	AUG. G.M. ~ LB.	AUG. LONG C.G. ~ IN.	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~ C _T
000	85.0	15780	7860	200.987	3240	LEVEL FLIGHT	0.009363
0	85.0	15810	7600	200.987	3240	LEVEL FLIGHT	0.009363
0	105.0	15840	7730	200.987	3240	LEVEL FLIGHT	0.006276

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. ALL ROCKET PODS EMPTY



AM-16 USA 871666
M.V. HOG CONFIGURATION WITH SELECT FOR PARTS REMOVED
SCALE ON

SYM	AIR SPEED	ANG ALT	ANG CL	ANG LONG	STNR ORIENTATION	THRUST CTR
000	CAS	MO FT	LS	CA MIN	200	C1
001	520	15100	7750	200 000	350 LEVEL FLIGHT	0.00 5363
002	520	15010	7600	200 000	350 LEVEL FLIGHT	0.00 5365
003	1040	15040	7750	200 000	350 LEVEL FLIGHT	0.00 5370

NOTE: ALL REQUESTS MUST BE LOGGED

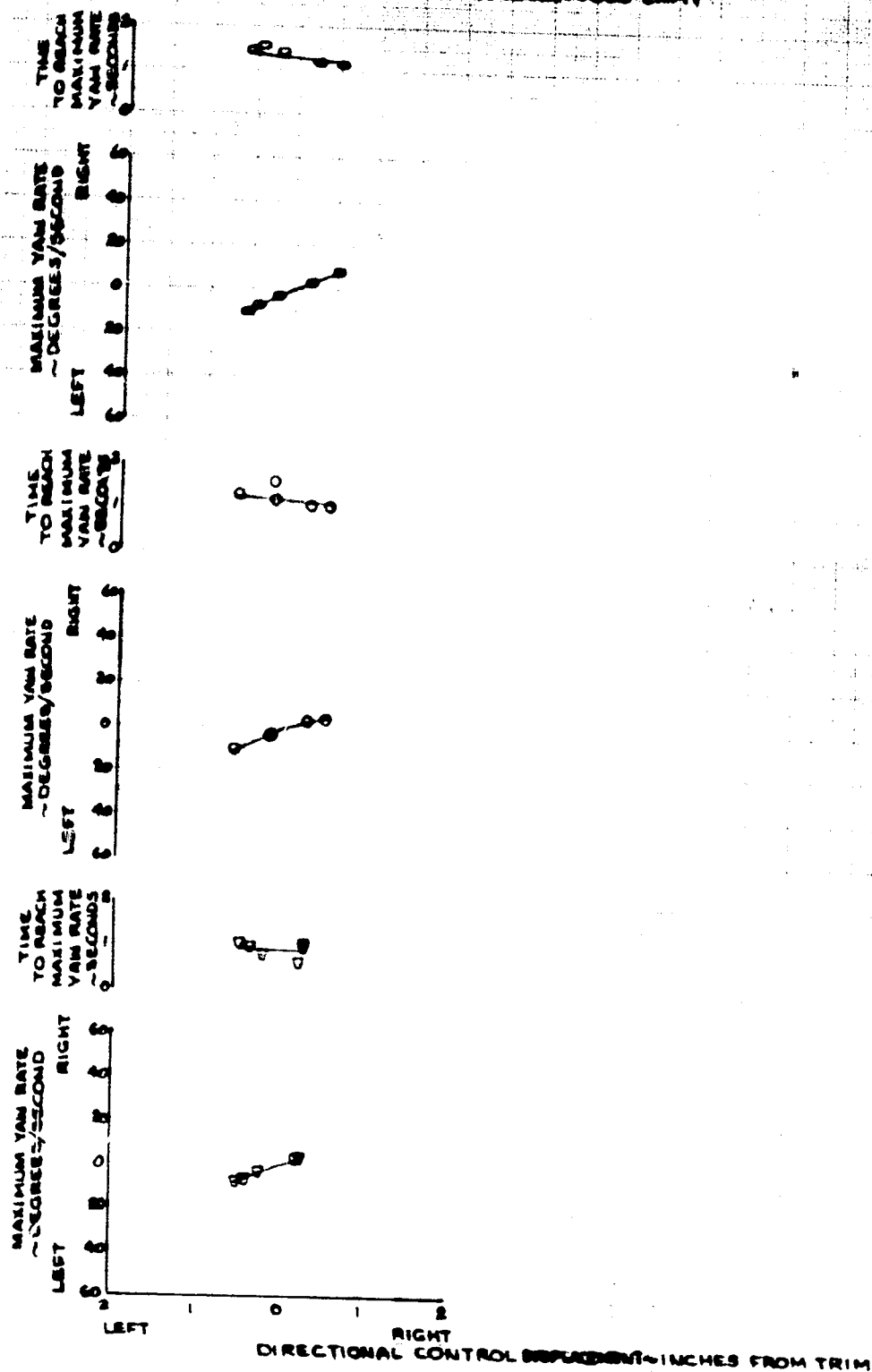


FIGURE No. 242
DIRECTIONAL RESPONSE AT ONE SECOND
 AH-1G USAF 715693

HYV. HOG CONFIGURATION WITH SOCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	AUG. ALT. ~ FT.	AUG. S-H ~ LB.	AUG. LONG. C.G. ~ IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF. ~ C _T
OS	85.0	15780	7860	200.9 (AF)	3240	LEVEL FLIGHT	0.006363
OS	85.0	16810	7600	200.9 (AF)	3240	LEVEL FLIGHT	0.006363
OS	105.0	16860	7780	200.9 (AF)	3240	LEVEL FLIGHT	0.006274

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. ALL SOCKET PODS EMPTY

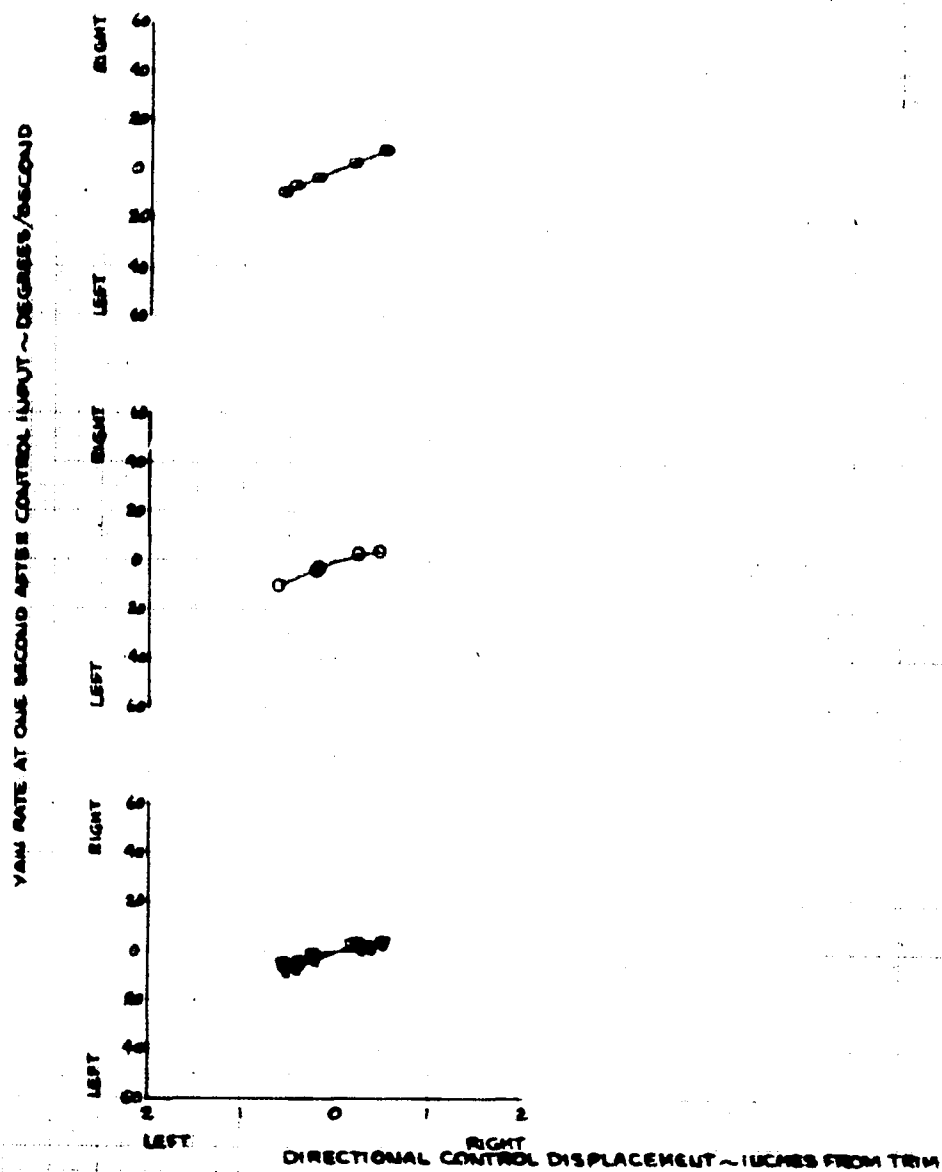


FIGURE NO. 243
ANGULAR YAW DISPLACEMENT

AM-1G USA 6718698
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AIR SPEED ~ CAS	AVG. ALT ~ FT	AVG. G.M. ~ LB	ANG. LONG. C.G. ~ IN	ROTOR RPM	FLIGHT CONDITION	THRUST COEFF ~ C _T
00	520	16160	7780	208.9 (AT)	3240	LEVEL FLIGHT	0.00 6385
01	520	17870	7500	208.9 (AT)	3240	LEVEL FLIGHT	0.00 6386
02	1020	16160	7650	208.9 (AT)	3240	LEVEL FLIGHT	0.00 6254

NOTED OPEN SYMBOLS DENOTE SCAS ON
SOLID SYMBOLS DENOTE SCAS OFF
ALL ROCKET PODS EMPTY

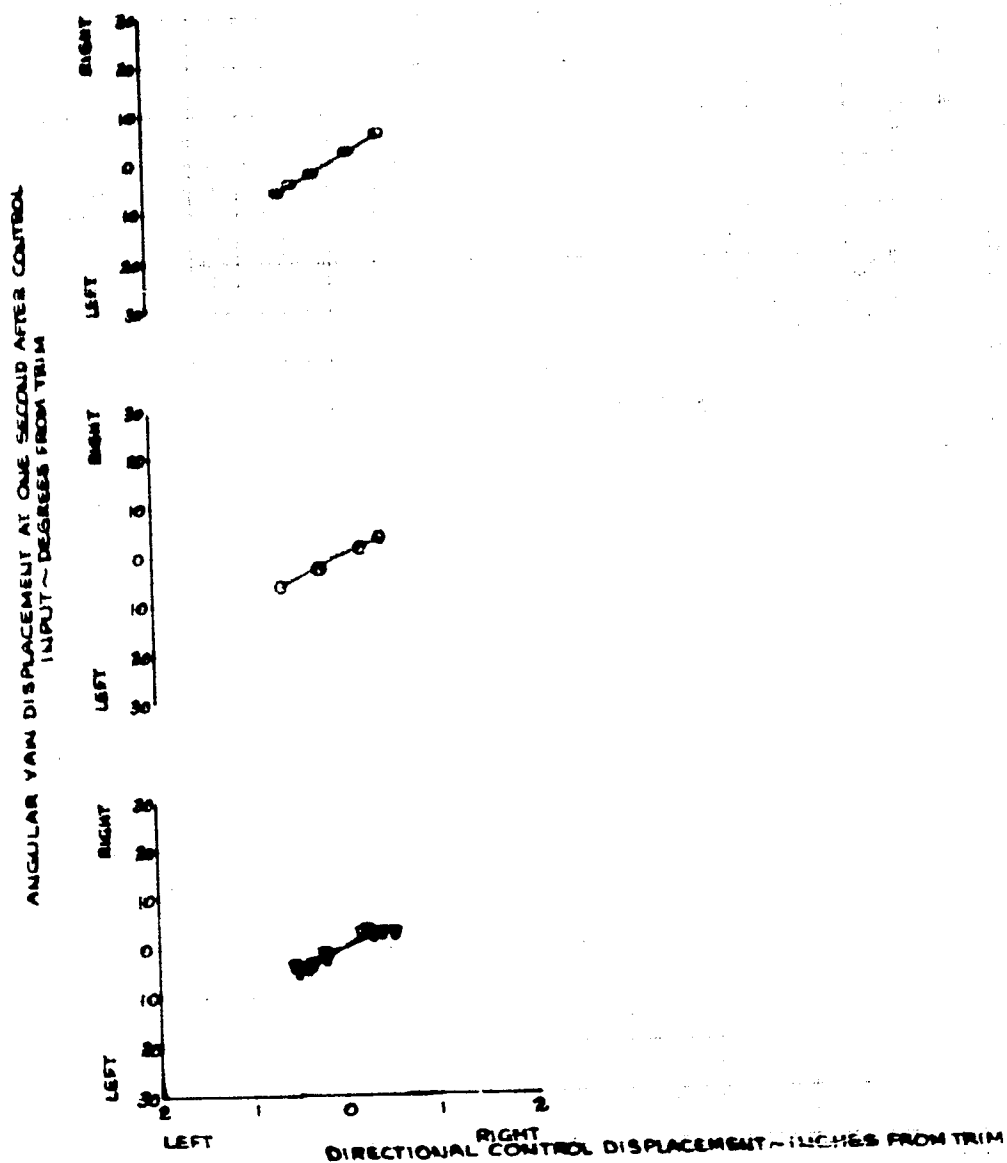


FIGURE NO. 244
LONGITUDINAL CONTROLLABILITY SUMMARY DURING HOVER
AH-1G

SYM	CONFIG	S/N	POD LOADING
○	CLEAN	618241	NO PODS
◐	MVT	MOG 618241	NOTED
◑	MVT	MOG 716411	PODS EMPTY
◒	MVT	MOG 716411	NOTED

NOTES: 1. OPEN SYMBOLS DENOTE FORWARD INPUT
2. SOLID SYMBOLS DENOTE AFT INPUT
3. PLAIN SYMBOLS DENOTE SCAS ON
4. FLASSED SYMBOLS DENOTE SCAS OFF

5. (V) ALL ROCKET PODS EMPTY
6. (D) 811 LB. IN 1800 ROCKET POD, 504 LB. IN 8100
ROCKET PODS. 1316 LB. TOTAL
7. POINTS DERIVED FROM FIGURES 239 THROUGH
256, APPENDIX 2D

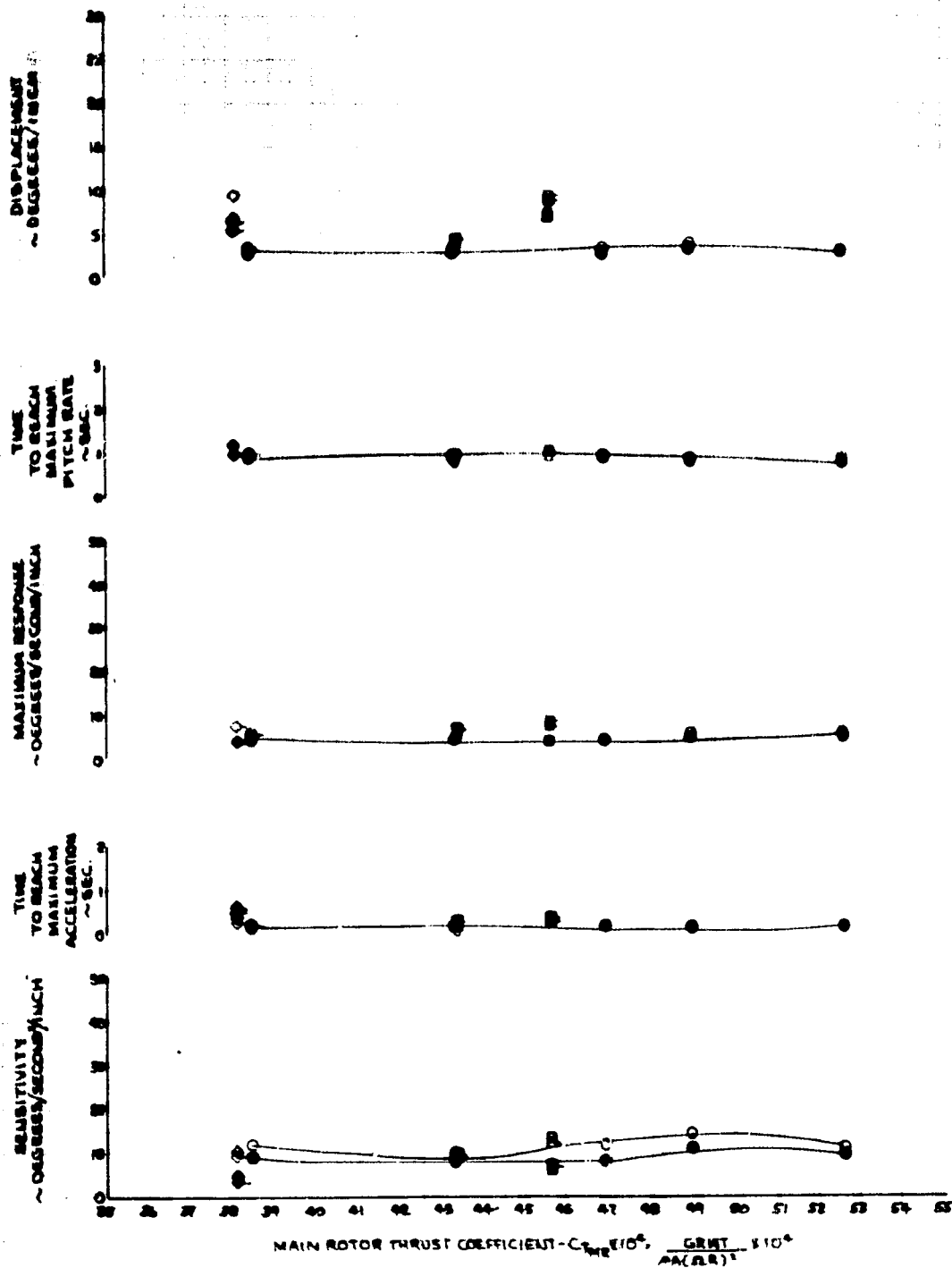


FIGURE NO. 245
LATERAL CONTROLLABILITY SUMMARY DURING HOVER
AH-1G

SYM	CONFIG	S/N	POD LOADING
○	CLEAN	61821	NO PODS
△	HVY. NOG	61821	ALL PODS EMPTY
▽	HVY. NOG	61821	NOTED
□	HVY. NOG	61821	ALL PODS LOADED
◇	HVY. NOG	71675	NOTED
◊	HVY. NOG	71675	ALL PODS EMPTY

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT 5. (□) SCAS ON - 287 LB. IN OUTED ROCKET PODS
2. SOLID SYMBOLS DENOTE RIGHT INPUT SCAS OFF - 259 LB. IN OUTED ROCKET PODS
3. PLAIN SYMBOLS DENOTE SCAS ON 6. (◇) ALL ROCKET PODS FULLY LOADED (1634 LB.)
4. FLAGGED SYMBOLS DENOTE SCAS OFF 7. POINTS DERIVED FROM FIGURES 257 THROUGH 266, APPENDIX VII.

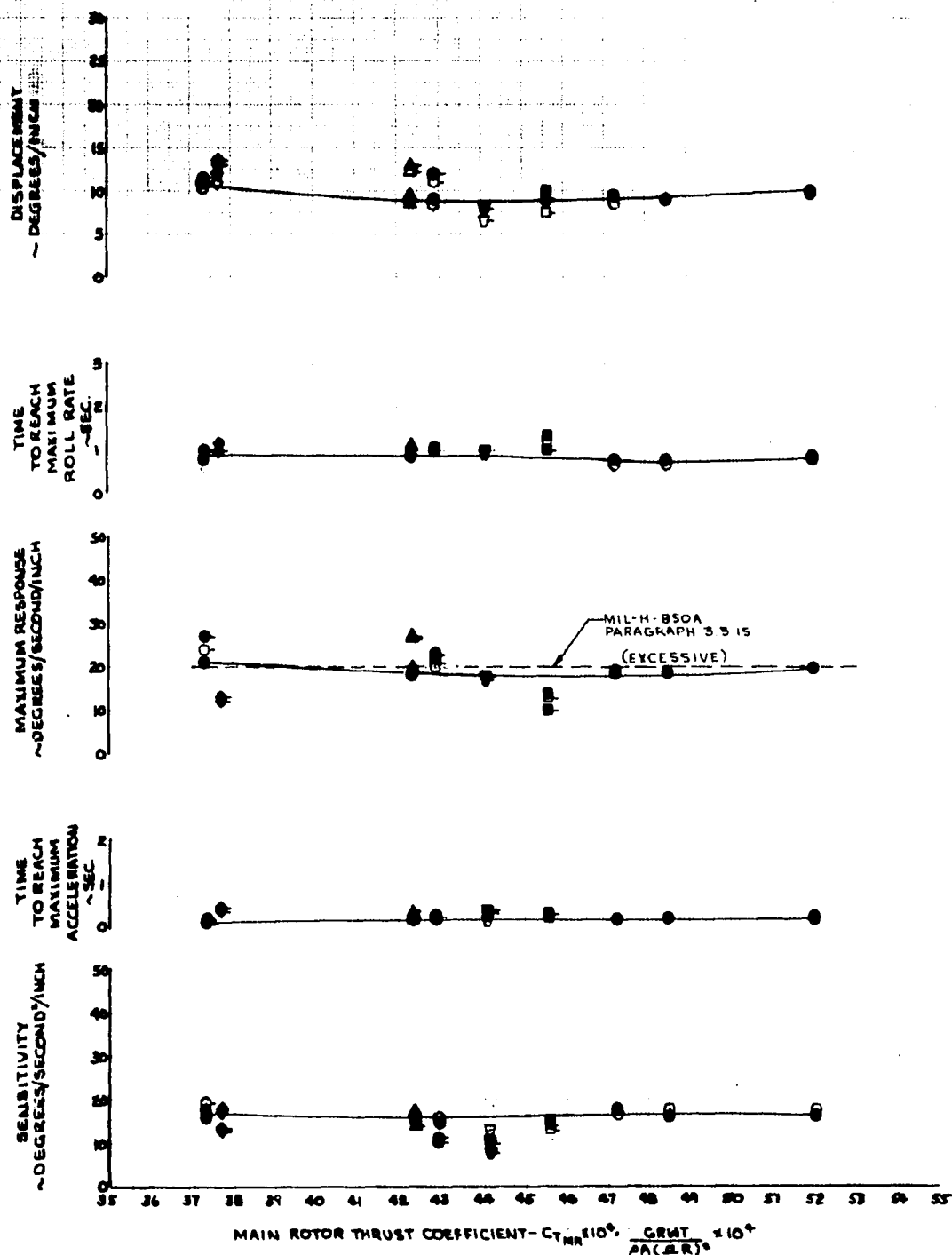


FIGURE NO 246
DIRECTIONAL CONTROLLABILITY SUMMARY DURING MANOEUVRE
AH-1G

SYM	CONFIG	S/N	POD LOADING
○	CLEAN	615247	NO PODS
△	HVY. HOG	615247	PODS EMPTY
▽	HVY. HOG	615247	NOTED
◊	HVY. HOG	715695	PODS EMPTY
□	HVY. HOG	715695	NOTED

NOTES: 1. OPEN SYMBOLS DENOTE LEFT INPUT

2. SOLID SYMBOLS DENOTE RIGHT INPUT

3. PLAIN SYMBOLS DENOTE SCAS ON

4. FLAGGED SYMBOLS DENOTE SCAS OFF

5. (7) $C_T = 0.004651$ ~ ALL ROCKET PODS EMPTY

$C_T = 0.004304$ ~ 359 LB. IN OUTBOARD ROCKET PODS

6. 517 LB. INBOARD ROCKET PODS, 341 LB. IN OUTBOARD ROCKET PODS. 1116 LB. TOTAL

7. DATA POINTS ADJUSTED TO COMPLY WITH MAXIMUM AVAILABLE PEDAL AT MOST CRITICAL SKID HEIGHT

8. POINTS DERIVED FROM FIGURES 247 THROUGH 249, APPENDIX III

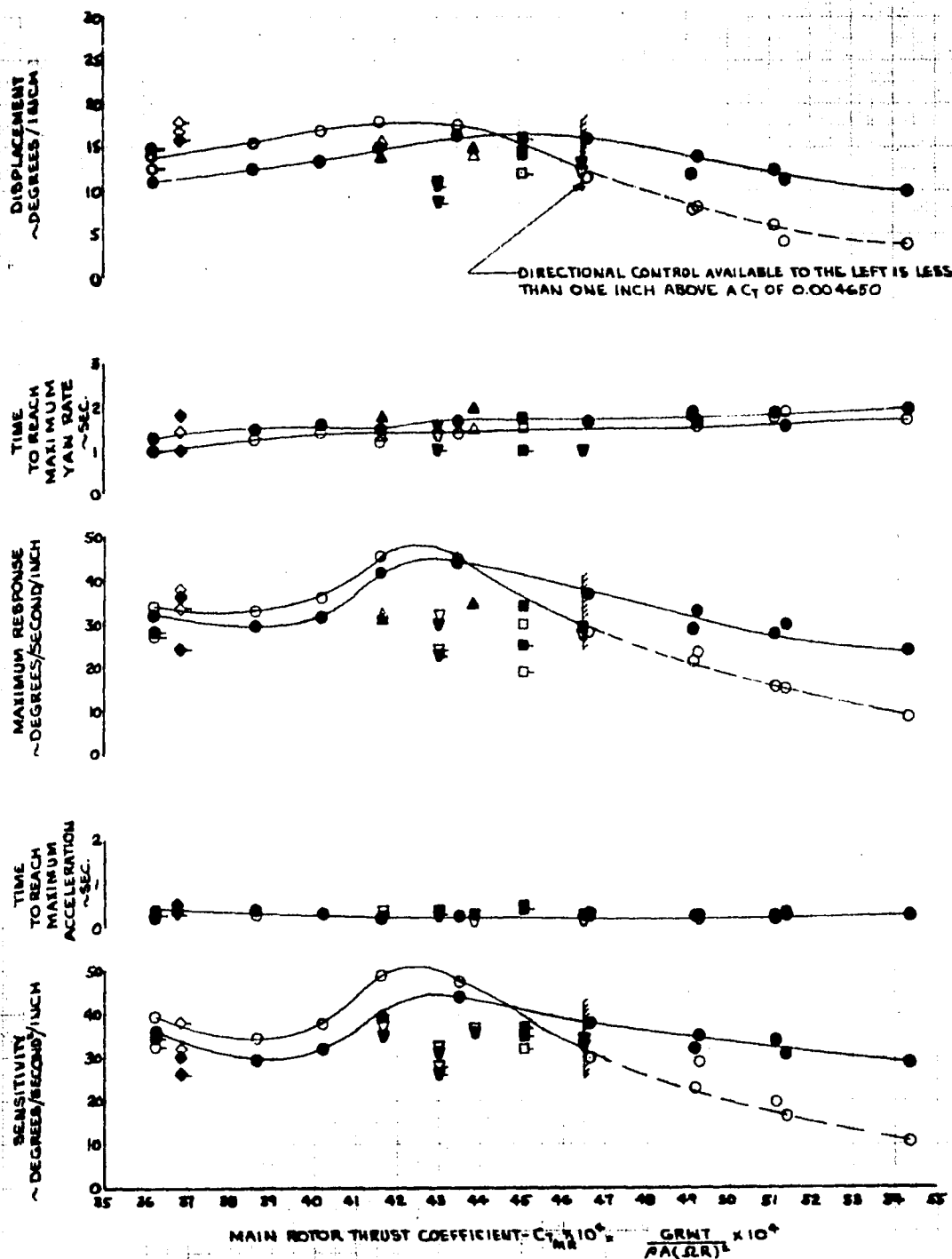


FIGURE NO. 247
LONGITUDINAL CONTROL SENSITIVITY
AH-1G USAF/USMC
CLEAN CONFIGURATION

SYMBOL	ALTITUDE ~FT.	AVG. H. ~LB.	AVG. LONG. C.G. ~IN.	ENGINE RPM	FLIGHT COND.	THRUST COEFF. ~C _T
○ (Open)	4560	7590	145.1 (WB)	323.0	HOVER	0.0049724
	4850	8460	145.3 (WB)	324.5		0.0049719
	5130	7870	145.7 (WB)	324.0		0.0049710
	10320	7750	145.4 (WB)	324.0		0.0049700
	610	7670	145.6 (WB)	324.0		0.0049700
	SEA LEVEL	8635	2004 (WB)	322.0		0.0049699

NOTES: 1. OPEN SYMBOLS REMOTE SCAS ON
2. SOLID SYMBOLS REMOTE SCAS OFF
3. SKID HEIGHT RANGE = 8 FT. → 15 FT.

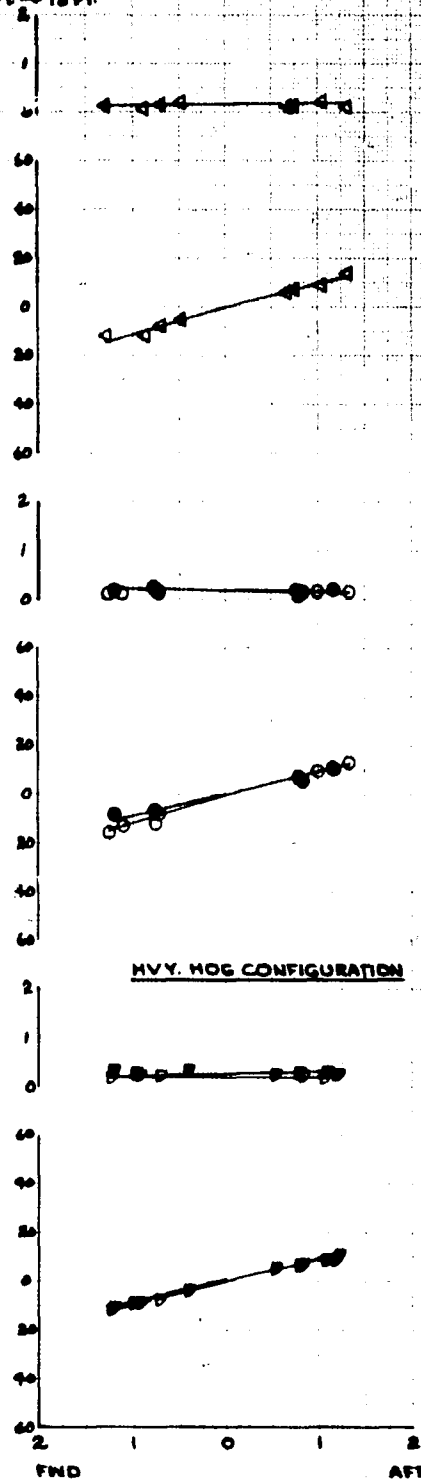
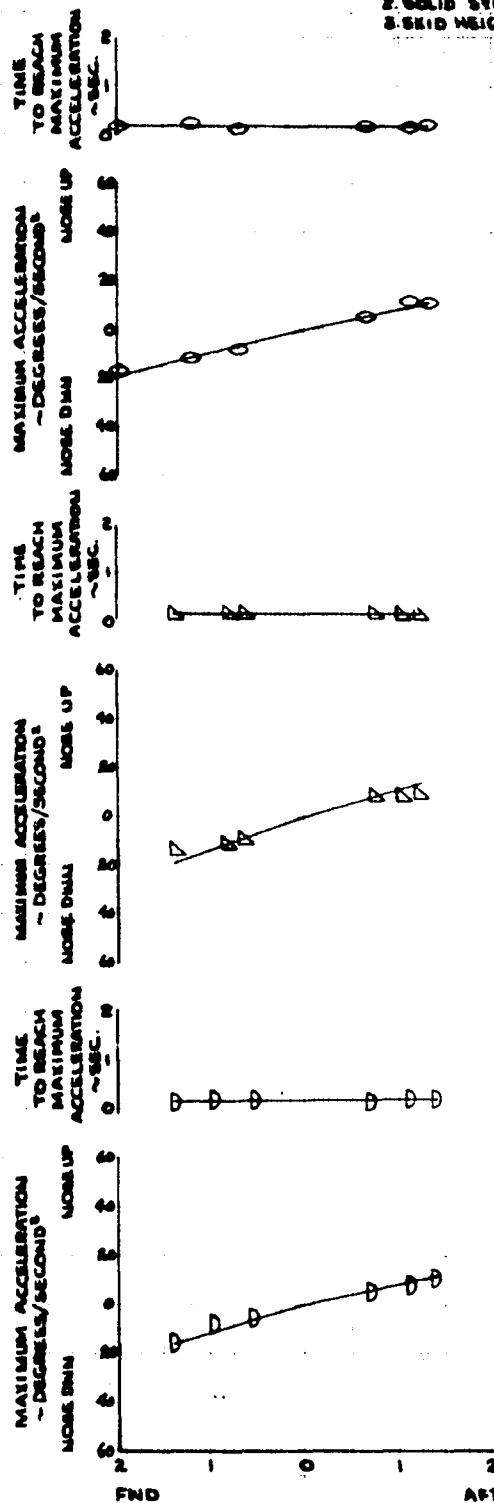


FIGURE NO. 248 **LONGITUDINAL CONTROL SENSITIVITY**

AH-1G USA 9215198

HVV HGS CONFIGURATION WITH EXCESS FGS FAIRING REMOVED

SYM	AVG ALT HGS-FT	AVG G.M. ~LB	AVG LONG. C.G. ~IN	AVG HOR. ~IN	FLIGHT ENG THROTTLE ~CT	THROTTLE ~CT
780	7590	201.4 (AFT)	3249	HOVER	0.00000	0.00000
780	9000	200.1 (AFT)	3249	HOVER	0.00000	0.00000

NOTES: 1. OPEN SYMBOLS DENOTE SCALE ON
2. SOLID SYMBOLS DENOTE SCALE OFF
3. SKID HEIGHT - 20 FEET

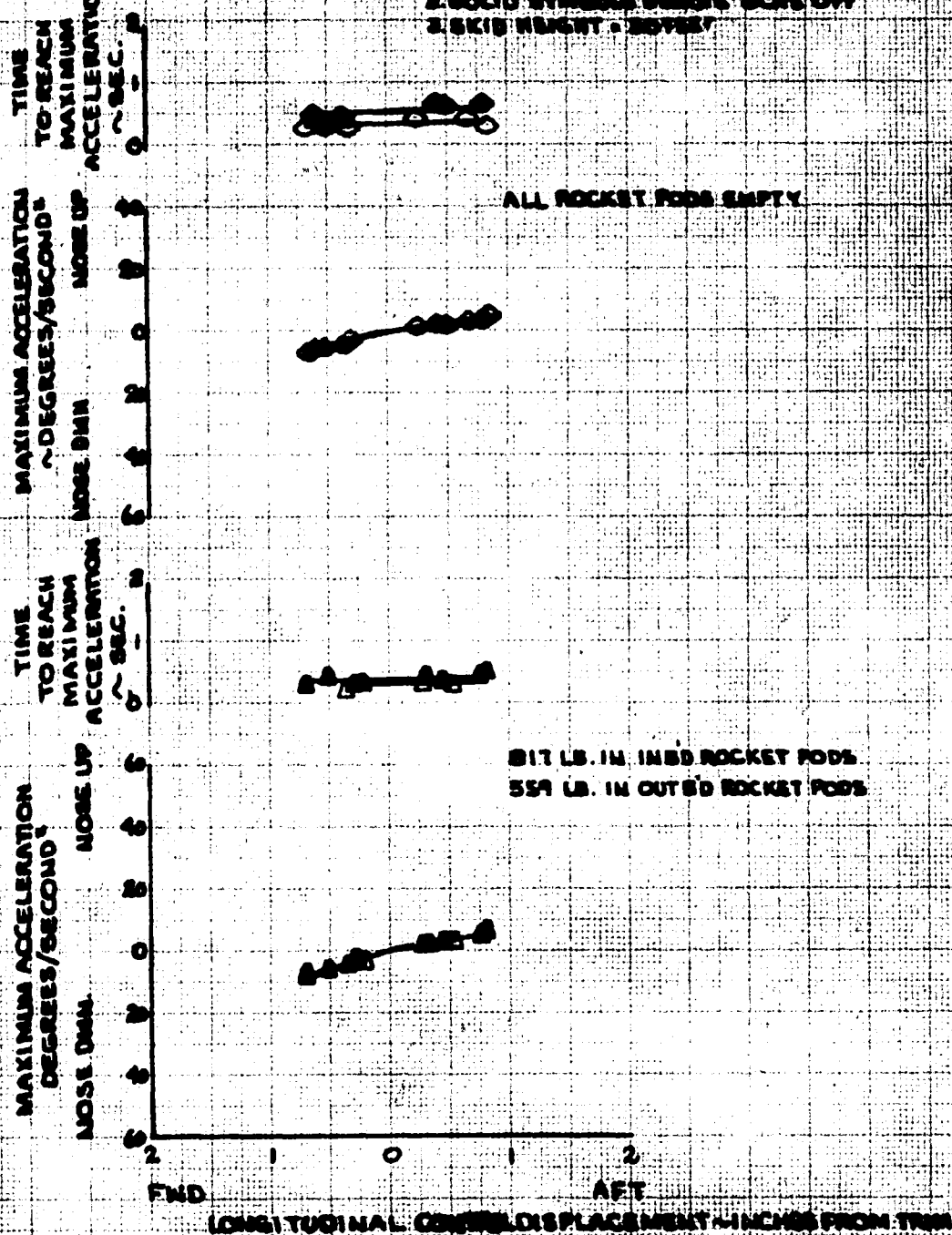


FIGURE NO 249 **LONGITUDINAL CONTROL SENSITIVITY**

AH-1G USAF 615 847
HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVE. ALT. H ₀ - FT.	AVE. G.M. ~ LB.	AVE. L.W.M. C.G. - IN.	ROTOR RPM	FLT. COND. HOVER	THRUST COEFF. ~ CT
D	SEA LEVEL	8635	220.4	322.0	HOVER	0.004341

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS OFF VALUES READ AT ONE SECOND
4. SKID HEIGHT RANGE - 8 FT. - 15 FT.

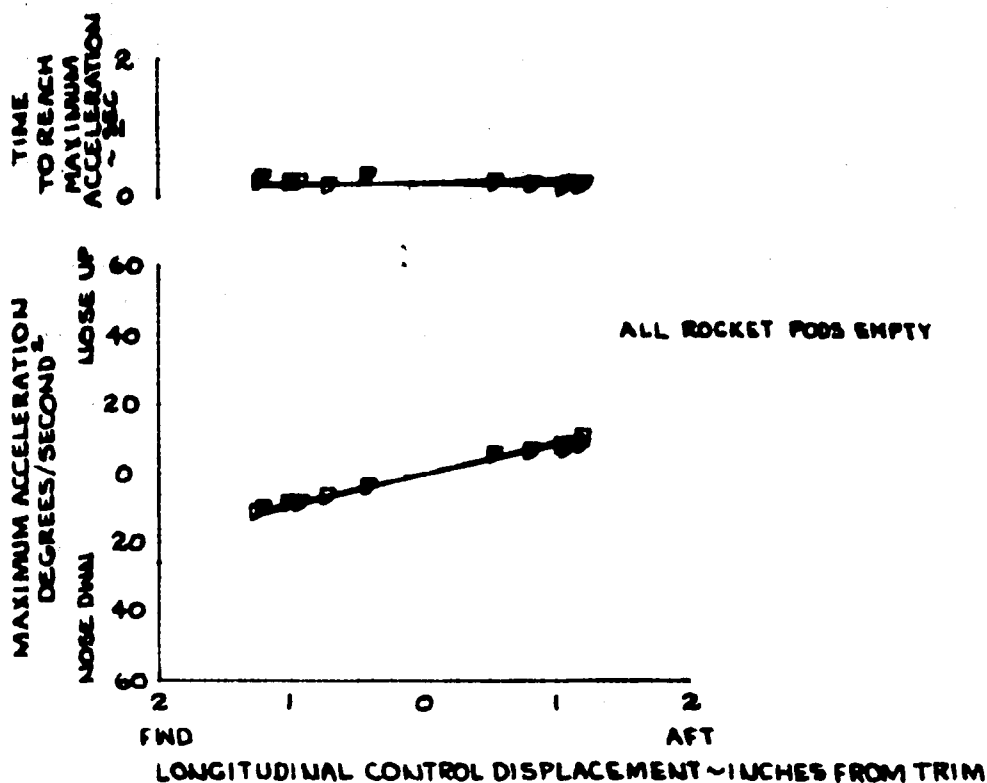


FIGURE No. 250
LONGITUDINAL CONTROL RESPONSE
 AH-1G UDA 96-8847
 CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEF. ~ C _T
○	4460	7590	195.9 (MID)	3210	HOVER	0.004329
△	4850	8560	195.3 (MID)	3245		0.004048
□	8550	7810	195.5 (MID)	3240		0.004100
◇	10320	7150	195.4 (MID)	3240		0.003268
●	610	7670	196.4 (MID)	3240		0.003071

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
 4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
 5. SKID HEIGHT 8000 FT. 5 FT. → 15 FT.

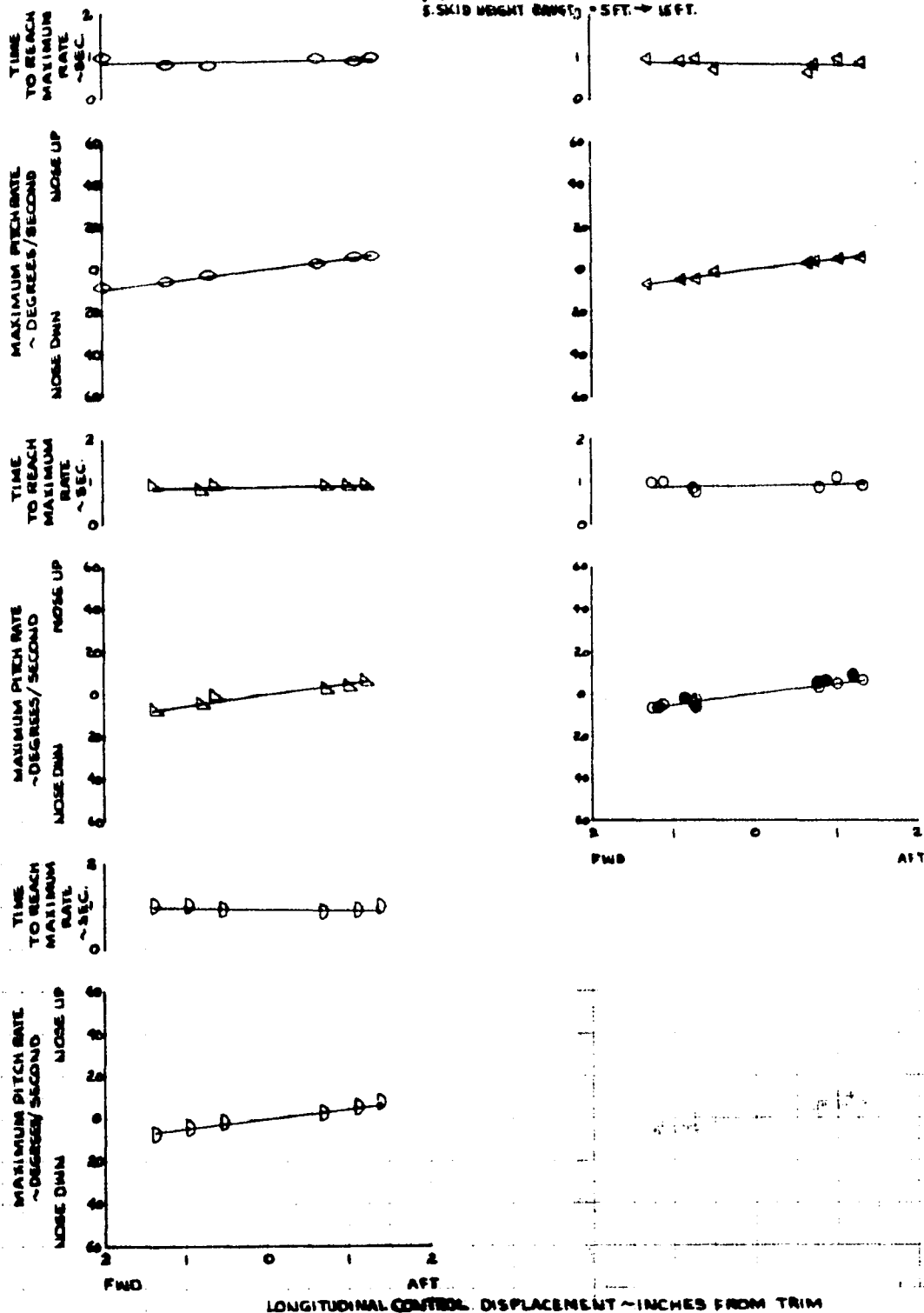


FIGURE NO. 251 LONGITUDINAL CONTROL RESPONSE

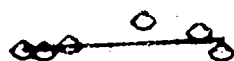
AH-1B USA 4/15/68

HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AVG. ALT. H ₀ ~ FT	AVG. G.W. ~ LB	AVG. LONG. C.G. ~ IN	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	750	7590	201.4 (AFT)	324.0	HOVER	0.00380
△	750	9000	200.1 (AFT)	324.0	HOVER	0.00480

NOTES: 1. ALL SCAS VALUES ARE MAXIMUM
2. SKID HEIGHT = 80 FT.

TIME
TO REACH
MAXIMUM
RATE
~ SEC.

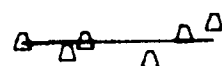


ROCKET PODS EMPTY

MAXIMUM PITCH RATE
~ DEGREES/SECOND
NOSE UP
NOSE DWN.



TIME
TO REACH
MAXIMUM
RATE
~ SEC.



817 LB. IN INB'D ROCKET PODS
569 LB. IN OUTB'D ROCKET PODS

MAXIMUM PITCH RATE
~ DEGREES/SECOND
NOSE UP
NOSE DWN



FWD

AFT

LONGITUDINAL CONTROL DISPLACEMENT ~ INCHES FROM TRIM

FIGURE NO. 252 **LONGITUDINAL RESPONSE AT ONE SECOND**

AN-18 USA 5115698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS OFF

SYM	AVG. ALT. H ₉ AFT.	AVG. G.W. ^ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	730	7590	201.4 (AFT)	3240	HOVER	0.003880
△	750	9000	200.1 (AFT)	3240	HOVER	0.004898

NOTE: SKID HEIGHT = 30 FT.

PITCH RATE AT ONE SECOND AFTER CONTROL INPUT
 ^ DEGREES/SECOND

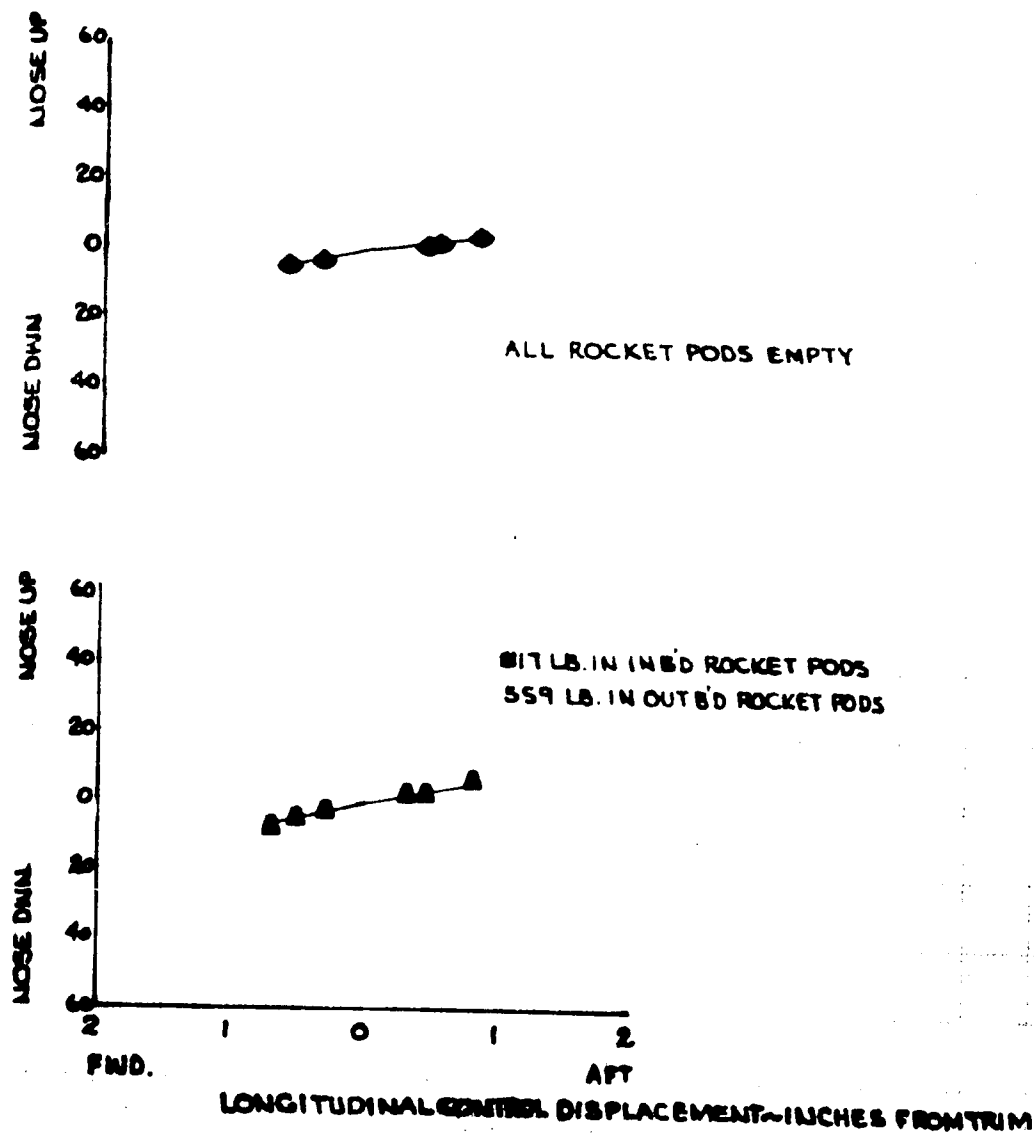


FIGURE No 253 **LONGITUDINAL CONTROL RESPONSE** **AH-1G USA 4,315,893**

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALT. H ₀ ~ FT	AVG. S.M. ~ LB.	AVG. LONG. C.A. ~ IN.	ROTOR RPM	FLY. COND.	THRUST COEFF. ~ C _T
○	SEA LEVEL	8635	200.4 (HFT)	322.0	HOVER	0.004861

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON 4. ALL SCAS OFF VALUES READ AT ONE SECOND
 2. SOLID SYMBOLS DENOTE SCAS OFF 5. SKID HEIGHT RANGE - 5 FT. → 15 FT.
 3. ALL SCAS ON VALUES ARE MAXIMUMS

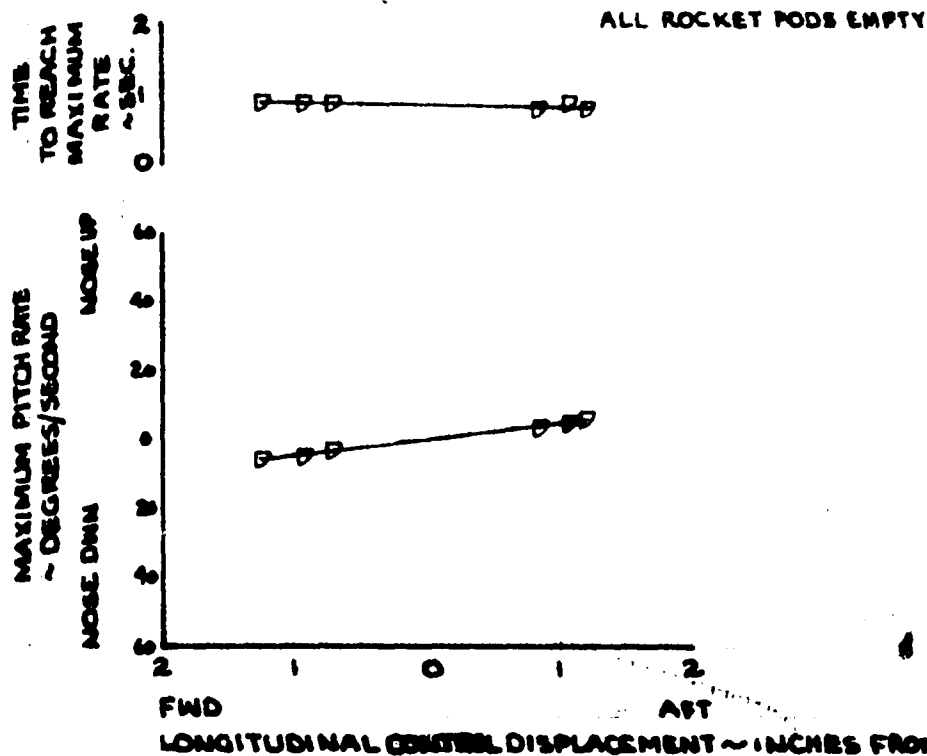
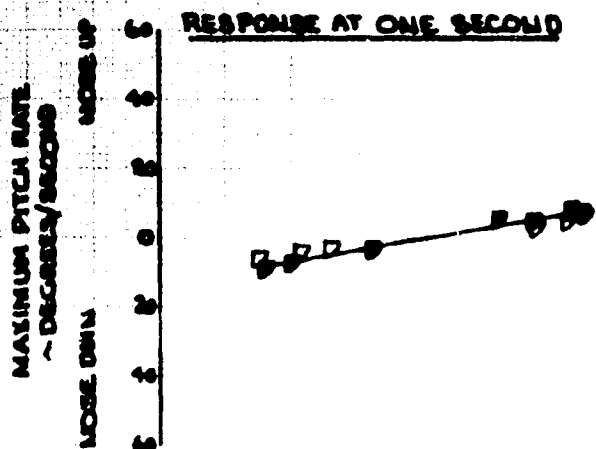


FIGURE No. 254
ANGULAR PITCH DISPLACEMENT
AH-1G USAF HUBBARD
CLEAN CONFIGURATION

SYMBOL	ALTITUDE H ₀ - FT.	AVG. G.M. - LB.	AVG. LONG. C.G. - IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. - C _T
○	4400	7800	175.0 (HUB)	325.0	NOYR	0.000000
●	4000	8000	175.0 (HUB)	325.0		0.000000
△	3600	7870	175.0 (HUB)	325.0		0.000000
□	10200	7750	175.0 (HUB)	325.0		0.000000
◇	8100	7810	175.0 (HUB)	325.0		0.000000
○	SEA LEVEL	8415	200.4 (ATT)	325.0		0.000000

NOTES: OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT RANGE - 5 FT. - 9.5 FT.

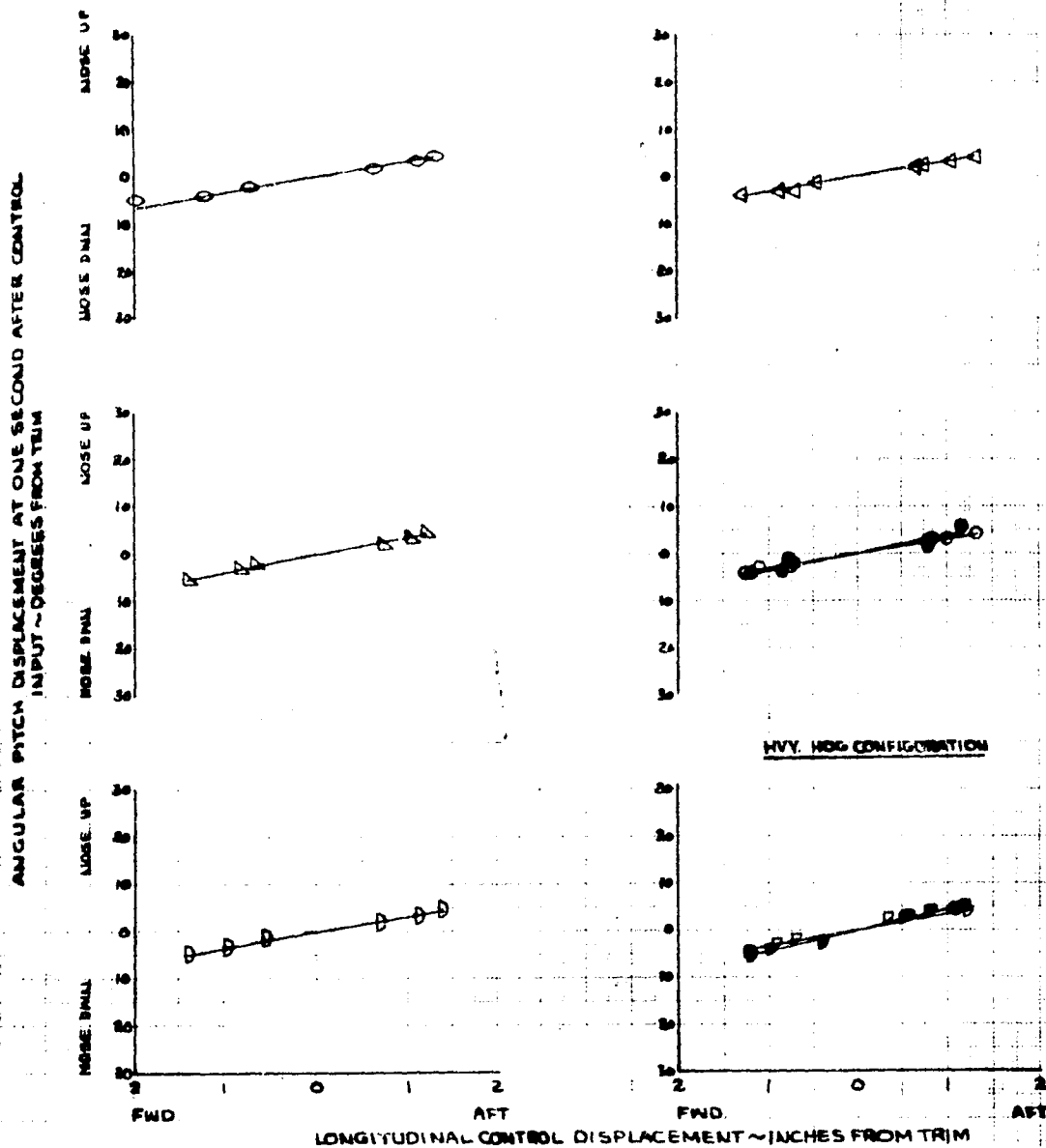


FIGURE NO. 255 **ANGULAR PITCH DISPLACEMENT**

**AH-1G UH-1H
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED**

SYM.	AVG. ALT. H ₀ ~ FT	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	730	7590	201.4 (AFT)	324.0	HOVER	0.003350
●	750	9000	200.1 (AFT)	324.0	HOVER	0.003350

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT ~ 30 FT.

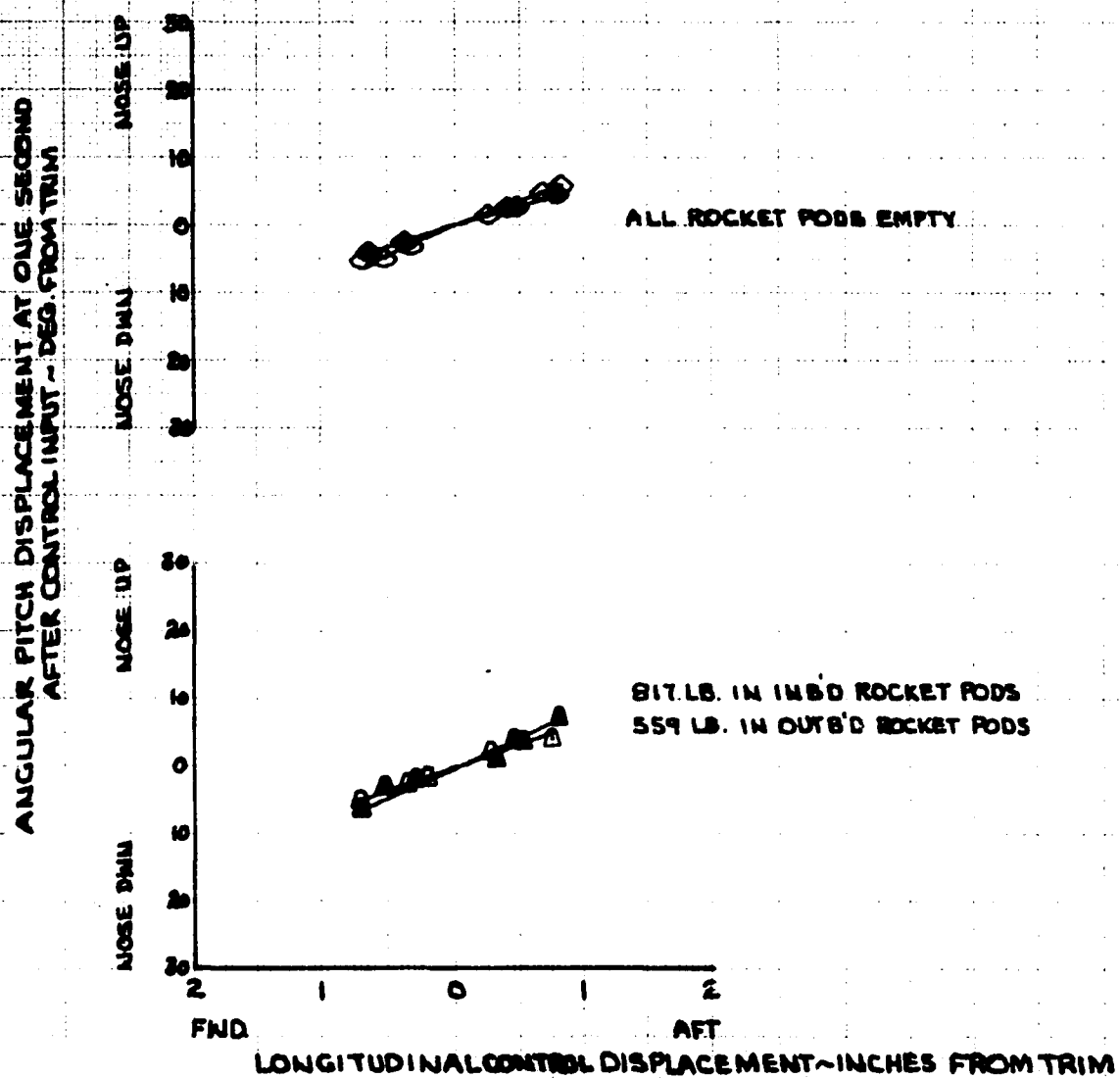


FIGURE NO. 256
ANGULAR PITCH DISPLACEMENT
AH-1G USA SN 615247

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALT. H ₀ -FT.	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~CT
D	SEA LEVEL	8635	200.4	322.0	HOVER	0.00434

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT RANGE - 5 FT → 15 FT.

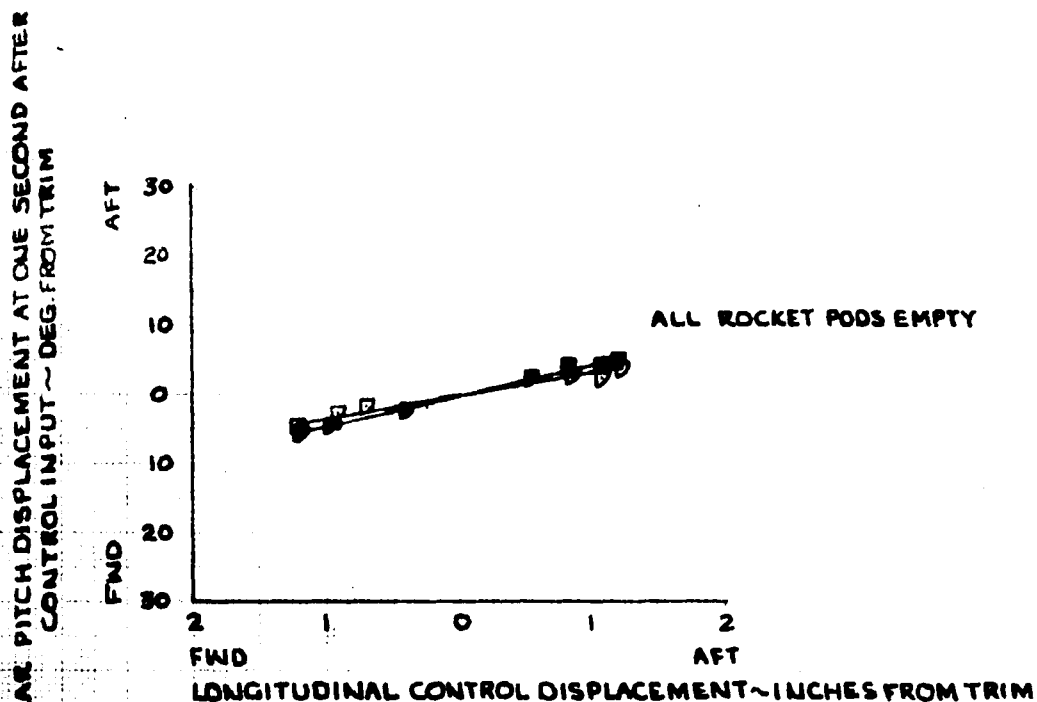


FIGURE NO. 257
LATERAL CONTROL SENSITIVITY
 AH-1G USAF 6818247
 CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ CT
△	4460	7420	195.8 (MID)	323.0	HOVER	0.004252
◇	4830	8480	195.3 (MID)	326.5		0.004897
◊	8530	7420	195.6 (MID)	324.0		0.004768
◊	10320	7660	195.8 (MID)	324.0		0.005282
○	550	7400	195.4 (MID)	324.0		0.005757

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT RANGE = 5 FT. → 15 FT.

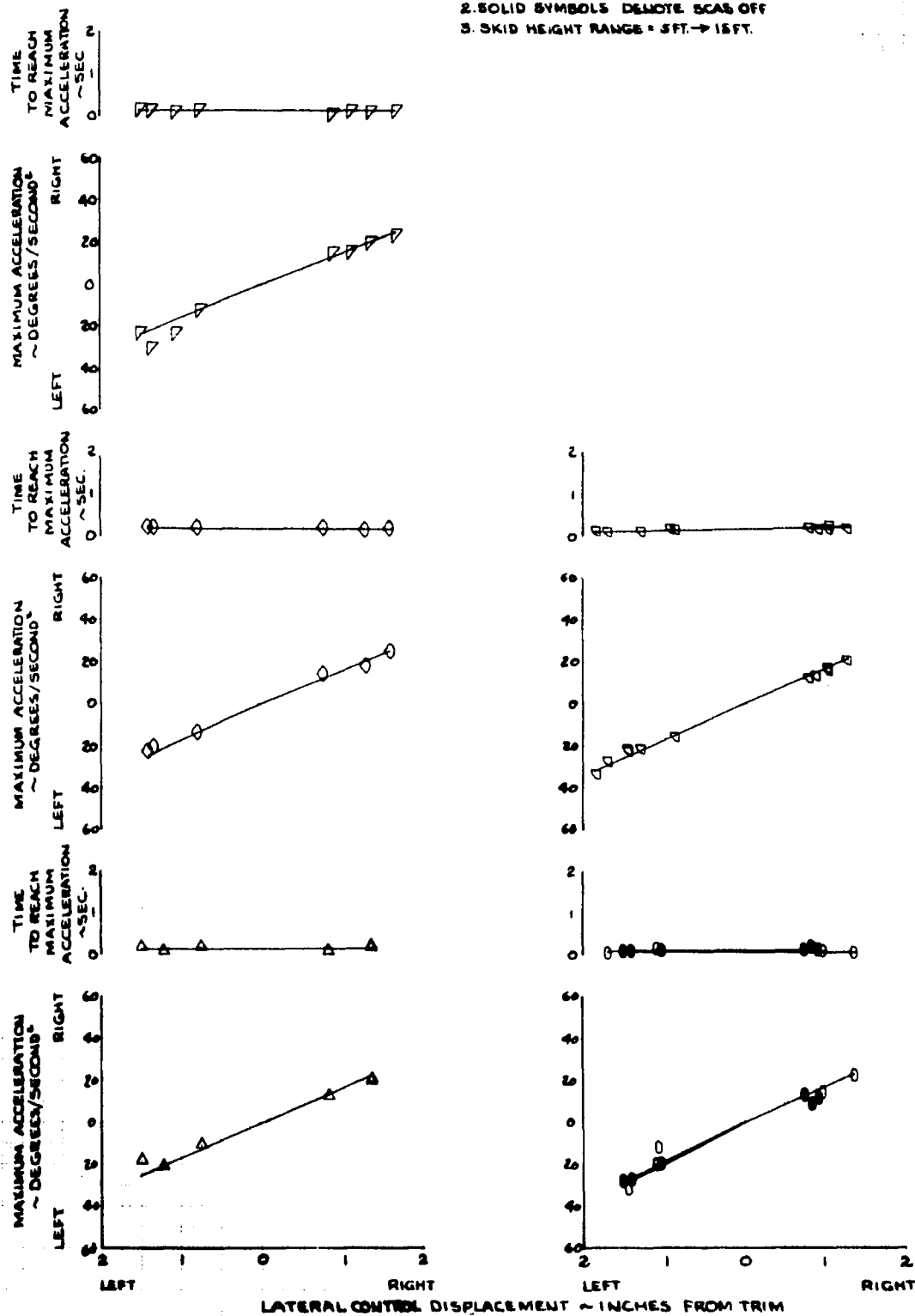


FIGURE NO. 258
LATERAL CONTROL SENSITIVITY
AH-1G USAF 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. ~FT	AVG. G.W. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
Δ	850	7420	201.4 (AFT)	324.0	HOVER	0.00377
◼	770	8980	199.8 (AFT)	324.0	HOVER	0.004560

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT = 30 FT.

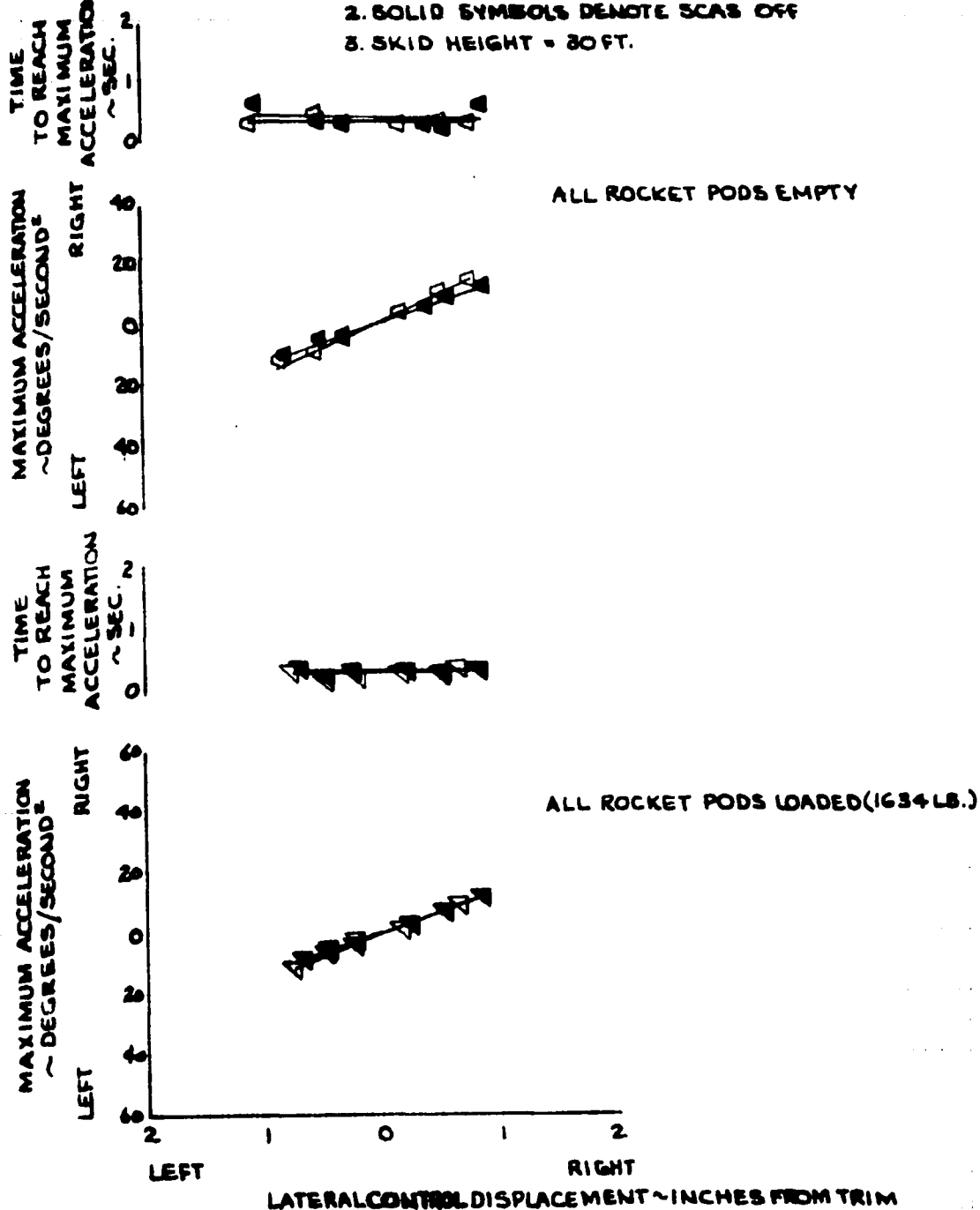


FIGURE No 259
LATERAL CONTROL RESPONSE
AH-1G USAFMS241
CLEAN CONFIGURATION

SYMBOL	AVG ALTITUDE H ₀ ~ FT.	AVG S.W. ~ LB	AVG LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
▽	4460	7420	198.8 (M1)	323.0	HOVER	0.004138
◇	4888	8480	198.2 (M1)	324.5		0.004809
△	8530	7420	198.6 (M1)	324.9		0.004768
○	10320	7660	198.8 (M1)	324.8		0.005882
○	880	7680	198.4 (M1)	324.0		0.003734

- NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE = 5 FT. → 15 FT.

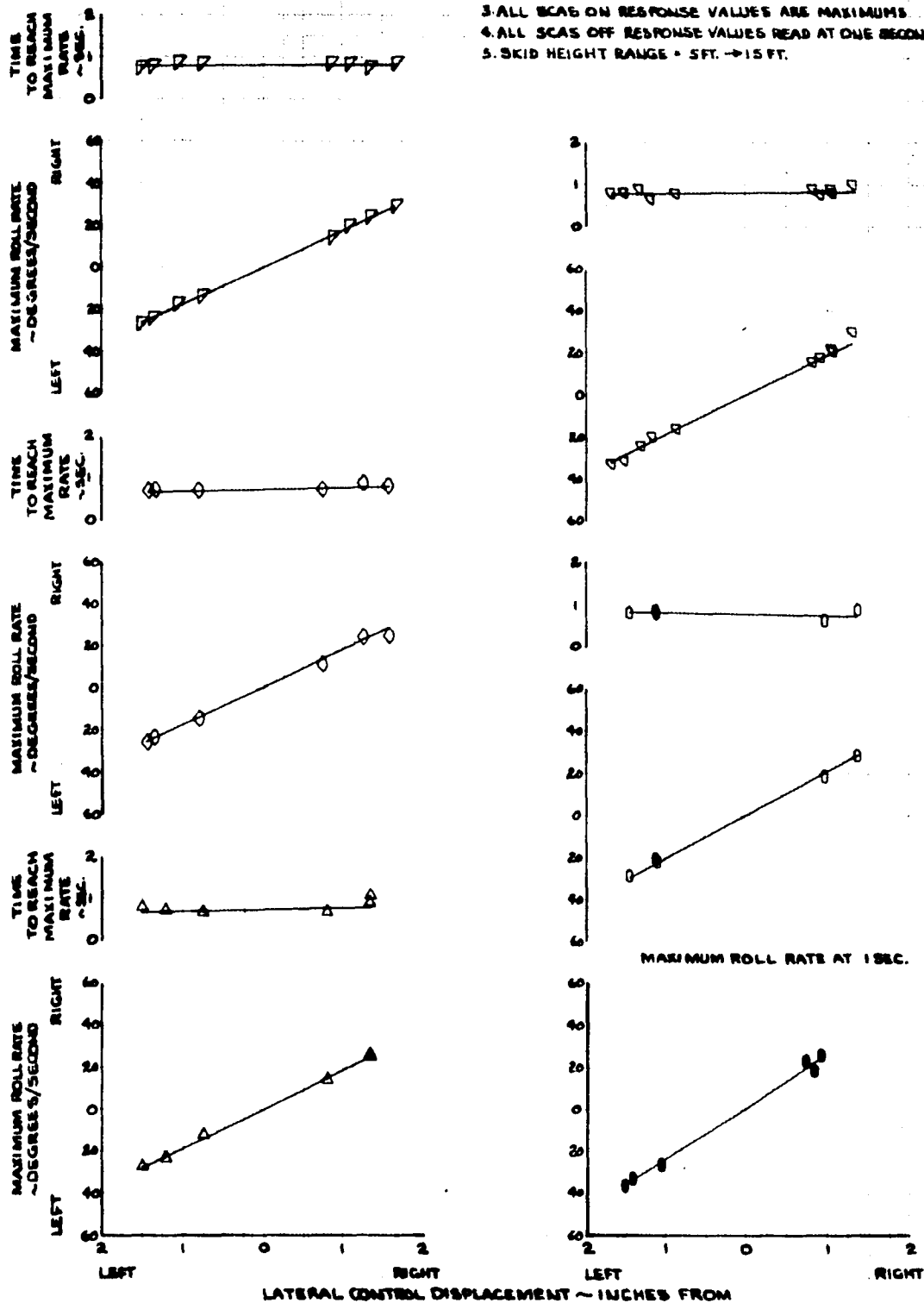


FIGURE No. 260
LATERAL CONTROL SENSITIVITY
AH-1G USA 1615809

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND	THRUST COEFF. ~ C _T
○	150	8600	1967 (MID)	322.5	HOVER	0.004800
●	400	8600	1960 (AFT)	322.0	HOVER	0.004800
◇	650	8700	2000 (AFT)	322.5	HOVER	0.004800

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE - 5 FT. - 15 FT.

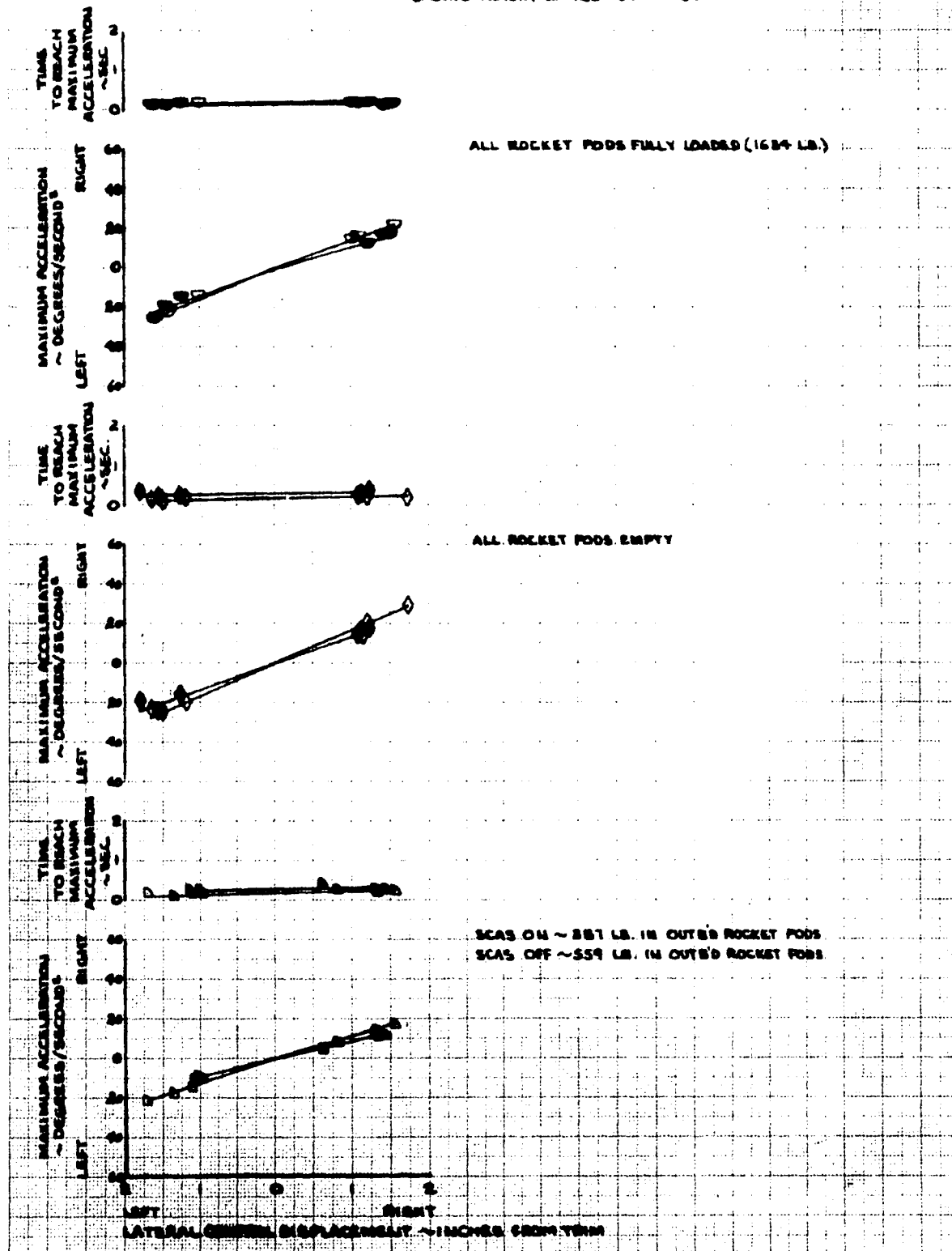


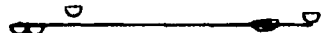
FIGURE No 261 LATERAL CONTROL RESPONSE AH-1G USAF 81889T

HVY. HOG CONFIGURATION: WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG ALTITUDE ~FT.	AVG. Wt. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~CT
◇◇	~160	8600	195.7 (MID)	3225	HOVER	0.004288
◇◇	~480	8600	195.8 (MID)	3225	HOVER	0.004287
◇◇	~880	8780	200.0 (MID)	3225	HOVER	0.004489

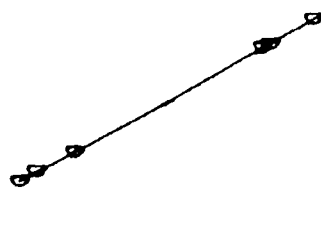
- NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE: 5 FT. → LEFT.

TIME
TO REACH
MAXIMUM
RATE
~SEC.



ALL ROCKET PODS FULLY LOADED (1634 LB.)

MAXIMUM ROLL RATE
~DEGREES/SECOND
RIGHT
LEFT

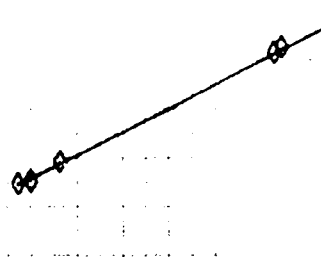


TIME
TO REACH
MAXIMUM
RATE
~SEC.



ALL ROCKET PODS EMPTY

MAXIMUM ROLL RATE
~DEGREES/SECOND
RIGHT
LEFT

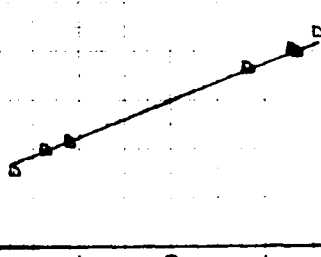


TIME
TO REACH
MAXIMUM
RATE
~SEC.



SCAS ON ~ 887 LB. IN OUTBOARD ROCKET PODS

MAXIMUM ROLL RATE
~DEGREES/SECOND
RIGHT
LEFT

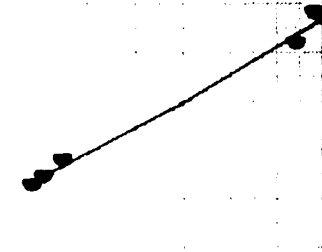


ROLL RATE AT ONE SECOND AFTER CONTROL INPUT ~ DEGREES/SECOND

RESPONSE AT ONE SECOND

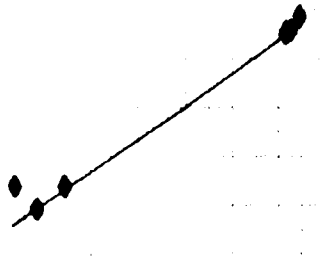
ALL ROCKET PODS FULLY LOADED (1634 LB.)

MAXIMUM ROLL RATE
~DEGREES/SECOND
RIGHT
LEFT



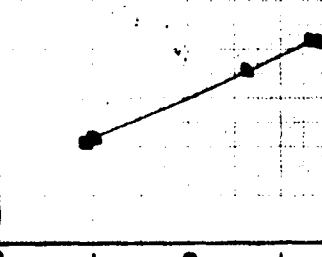
ALL ROCKET PODS EMPTY

MAXIMUM ROLL RATE
~DEGREES/SECOND
RIGHT
LEFT



SCAS OFF ~ 887 LB. IN OUTBOARD ROCKET PODS

MAXIMUM ROLL RATE
~DEGREES/SECOND
RIGHT
LEFT



LATERAL CONTROL DISPLACEMENT ~INCHES FROM TRIM

FIGURE No. 262
ANGULAR ROLL DISPLACEMENT
AH-1G USAF 618867

HVV, HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE ~FT.	AVG. G.M. ~LB.	AVG. LONG. C.G. ~IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
□	150	5500	1953 (MID)	328.5	HOVER	0.004320
●	400	5500	1953 (MID)	328.5	HOVER	0.004320
○	650	5700	2022 (MID)	322.5	HOVER	0.004420

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT RANGE - 5FT. - 15FT.

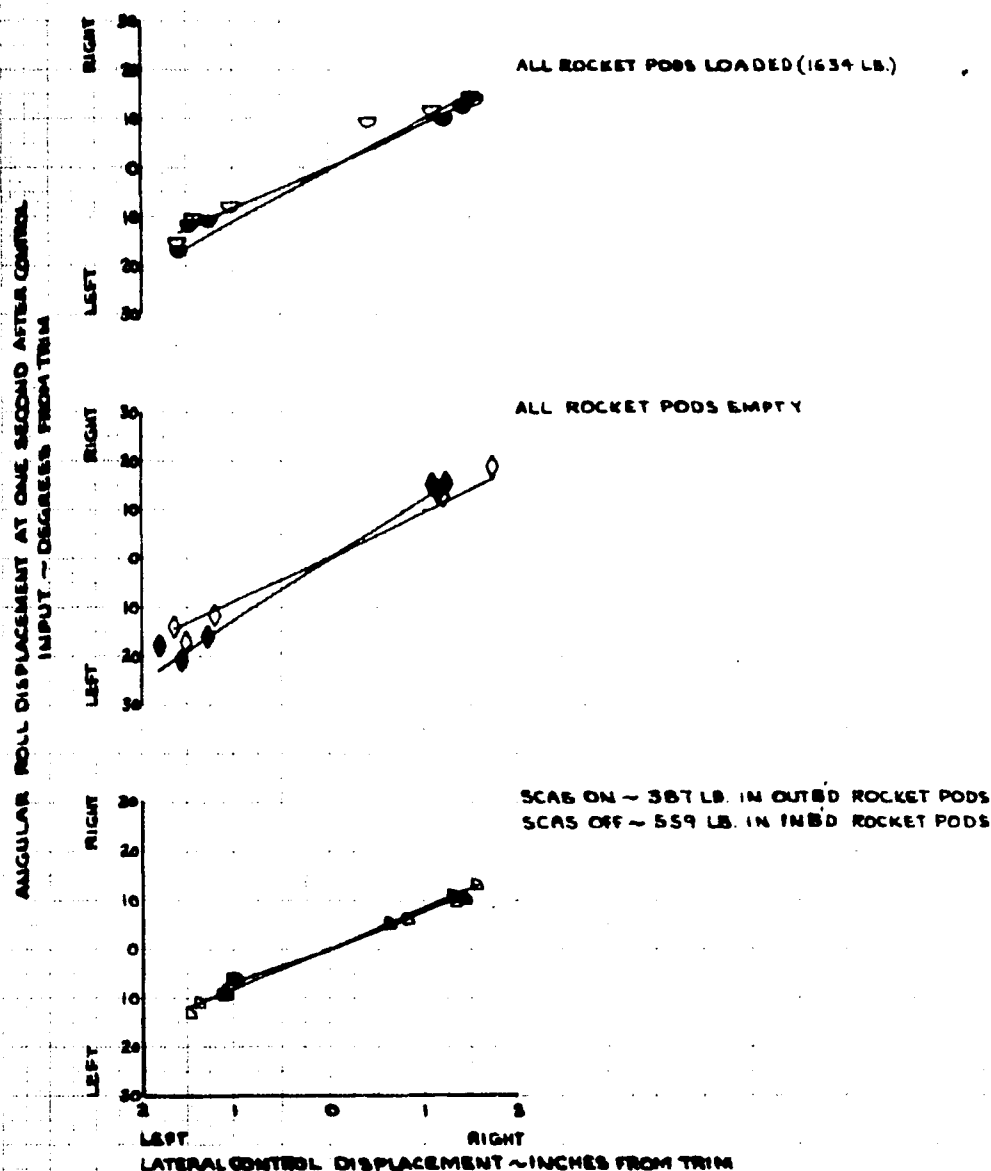


FIGURE No. 263 **LATERAL CONTROL RESPONSE**

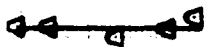
AH-1G USA 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
Δ	850	7420	201.4 (APT)	524.0	HOVER	0.003773
Δ	770	8980	199.8 (APT)	524.0	HOVER	0.004560

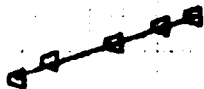
NOTE: SKID HEIGHT = 30 FT.

TIME
TO REACH
MAXIMUM
ROLL RATE
~ SEC.

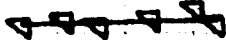


ALL ROCKET PODS EMPTY

MAXIMUM ROLL RATE
~ DEGREES/SECOND
LEFT RIGHT

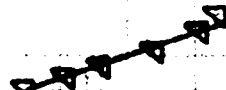


TIME
TO REACH
MAXIMUM
ROLL RATE
~ SEC.



ALL ROCKET PODS FULLY LOADED (1634 LB.)

MAXIMUM ROLL RATE
~ DEGREES/SECOND
LEFT RIGHT



LEFT

RIGHT

LATERAL CONTROL RESPONSE IN DEGREES FROM TRIM

FIGURE NO. 264
LATERAL RESPONSE AT ONE SECOND
 AH-1B USA 715698

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
Δ	880	7420	201.4 (APT)	3840	HOVER	0.20572
▽	770	8180	199.8 (IFT)	3810	HOVER	0.204510

NOTE: SKID HEIGHT ~ 30 FT.

ROLL RATE AT ONE SECOND AFTER CONTROL INPUT ~ DEGREE/SECOND

RIGHT
LEFT

ALL ROCKET PODS EMPTY

RIGHT
LEFT

ALL ROCKET PODS FULLY LOADED (1634 LB.)

LEFT
RIGHT

LATERAL CONTROL DISPLACEMENT ~ INCHES FROM TRIM

FIGURE No 265
ANGULAR ROLL DISPLACEMENT

AN-16 USA 75018807
CLEAN CONFIGURATION

SYMBOL	ANG. RATES		ANG. C.N.		ANG. LONG.		SPEED (LIGHT COND.)		TARGET COSTS	
	~10-15	~15	~15	~15	C.G.~10.	~10	~10	~10	~10	~10
DODDO	4450	4450	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250
	4450	4450	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250
	4450	4450	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250
	10330	10330	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250
	5150	5150	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250	1954 (MIB)	3250

NOTES: 1.OPEN SYMBOLS DENOTE SCAS ON
2.SOLID SYMBOLS DENOTE SCAS OFF
3.BUILD HEIGHT RANGE: 5 FT. TO 15 FT.

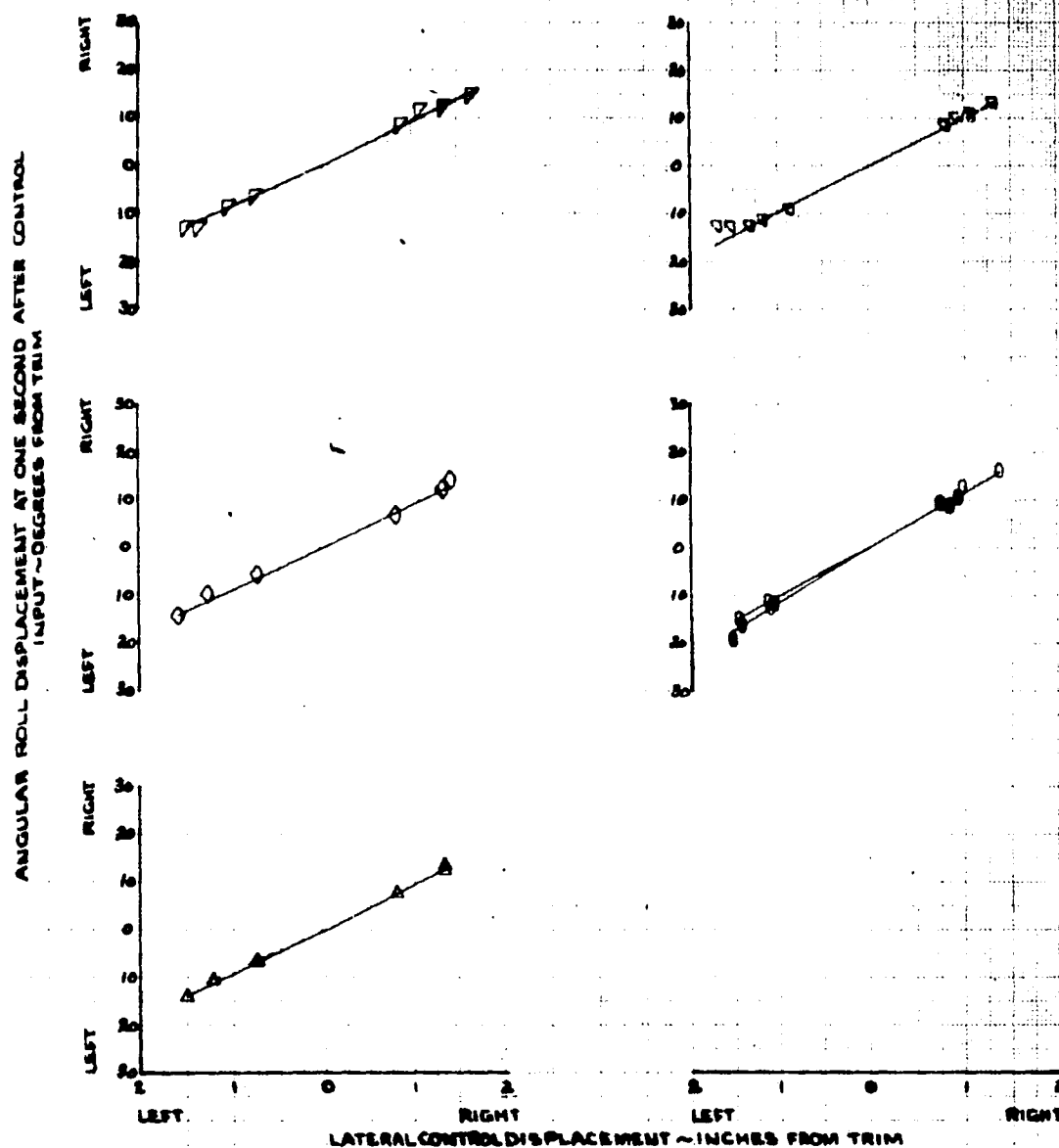


FIGURE NO. 266 **ANGULAR ROLL DISPLACEMENT**

AH-1G USA 94T15693

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM	AVG. ALT. H ₀ ~ FT.	AVG. G.M. ~ LB.	AVG. LONG. C.G. ~ IN	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
△	850	7420	284 (AFT) 284	2800	HEVER	0.8857E1
▽	770	8700	443 (AFT) 300	3000	HEVER	0.8846E1

- NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT = 30 FT

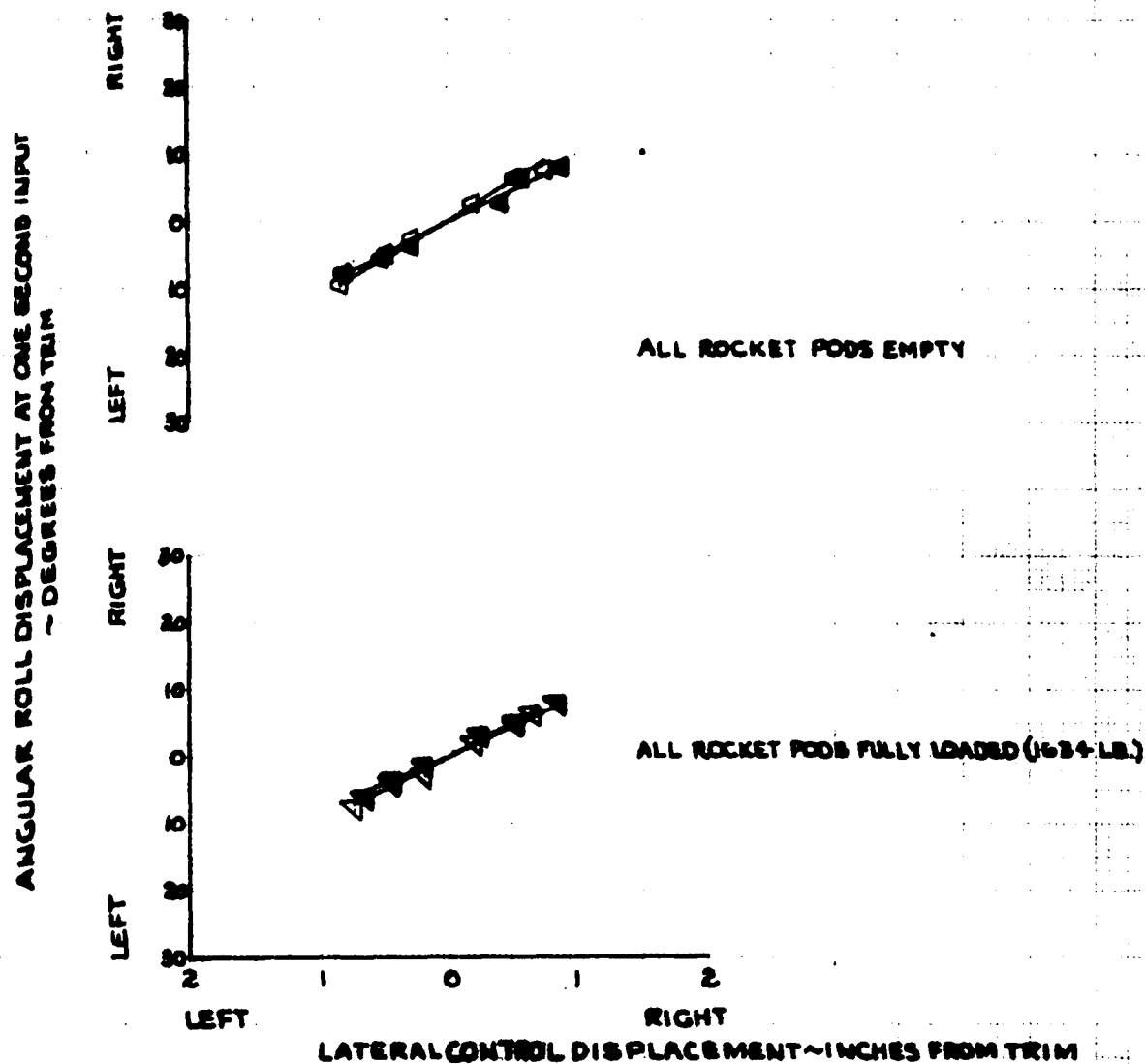


FIGURE NO. 267
DIRECTIONAL CONTROL SENSITIVITY
AM-1G USA 6018847
CLEAN CONFIGURATION
SCAS ON

SYMBOL	AVG ALTITUDE H ₀ ~ FT.	AVG G.M. ~ LB.	AVG LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	4580	7280	195.6 (MID)	3230	HOVER	0.004168
○	4580	7220	195.6 (MID)	314.5		0.004360
○	4790	8630	195.4 (MID)	324.5		0.004926
○	4860	8400	195.2 (MID)	314.5		0.005114
○	4550	7330	195.5 (MID)	324.0		0.004718
○	4550	7270	195.4 (MID)	314.5		0.004418

NOTES: 1. SKID HEIGHT RANGE ~ 5 FT ~ LEFT.
2. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004460

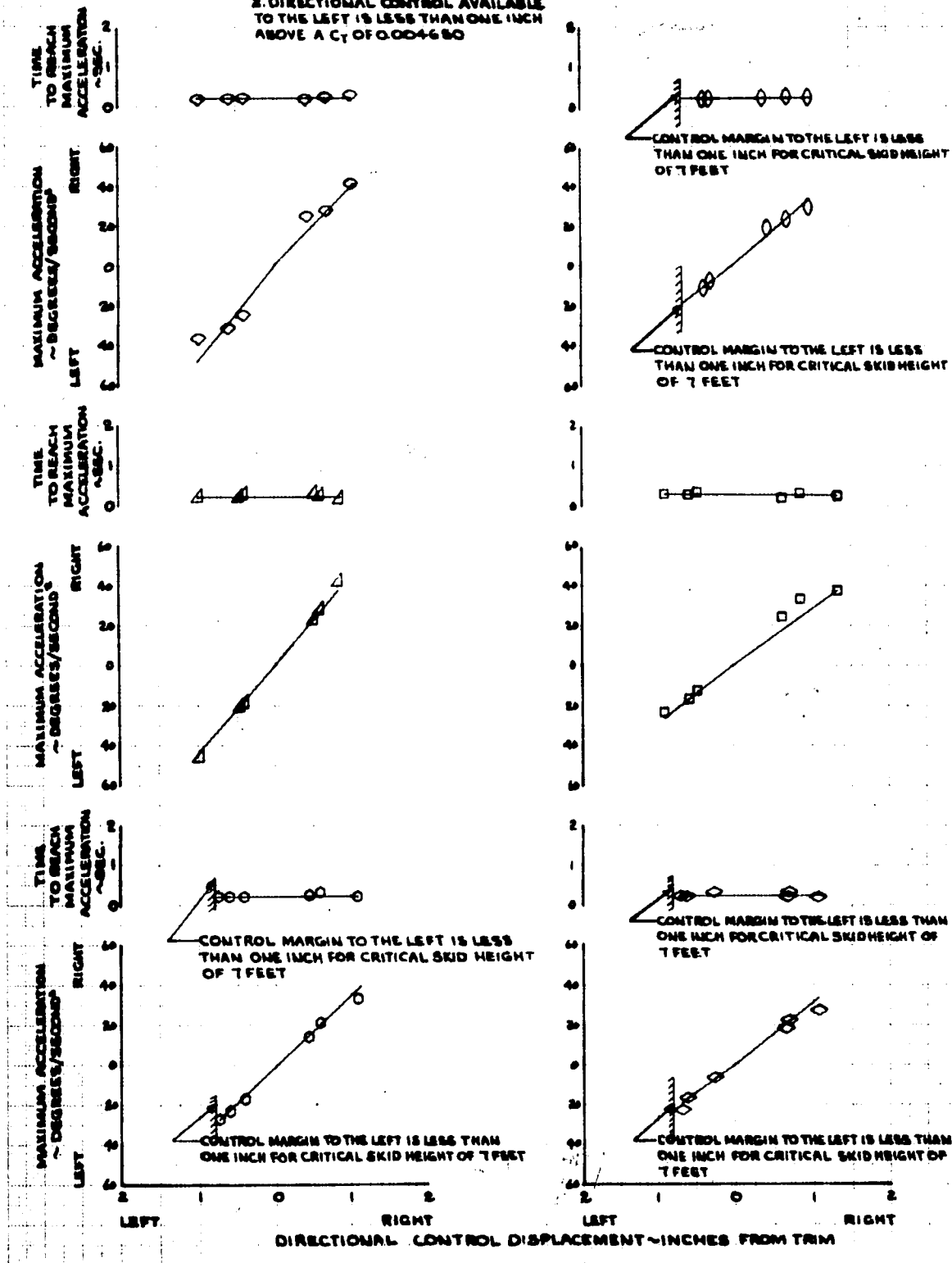


FIGURE No. 268
DIRECTIONAL CONTROL SENSITIVITY
 AH-1G USAF 815847
 CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H ₀ ~ FT.	AVG. G.W. ~ LB	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	10320	7560	195.7 (MID)	324.0	HOVER	0.005134
○	10320	7490	195.2 (MID)	313.5		0.004953
○	560	7170	195.2 (MID)	324.0		0.004620
○	550	7160	195.1 (MID)	313.5		0.004589
○	570	6980	194.9 (MID)	303.5		0.004516

- NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT RANGE - 5FT - 15FT
 4. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004650

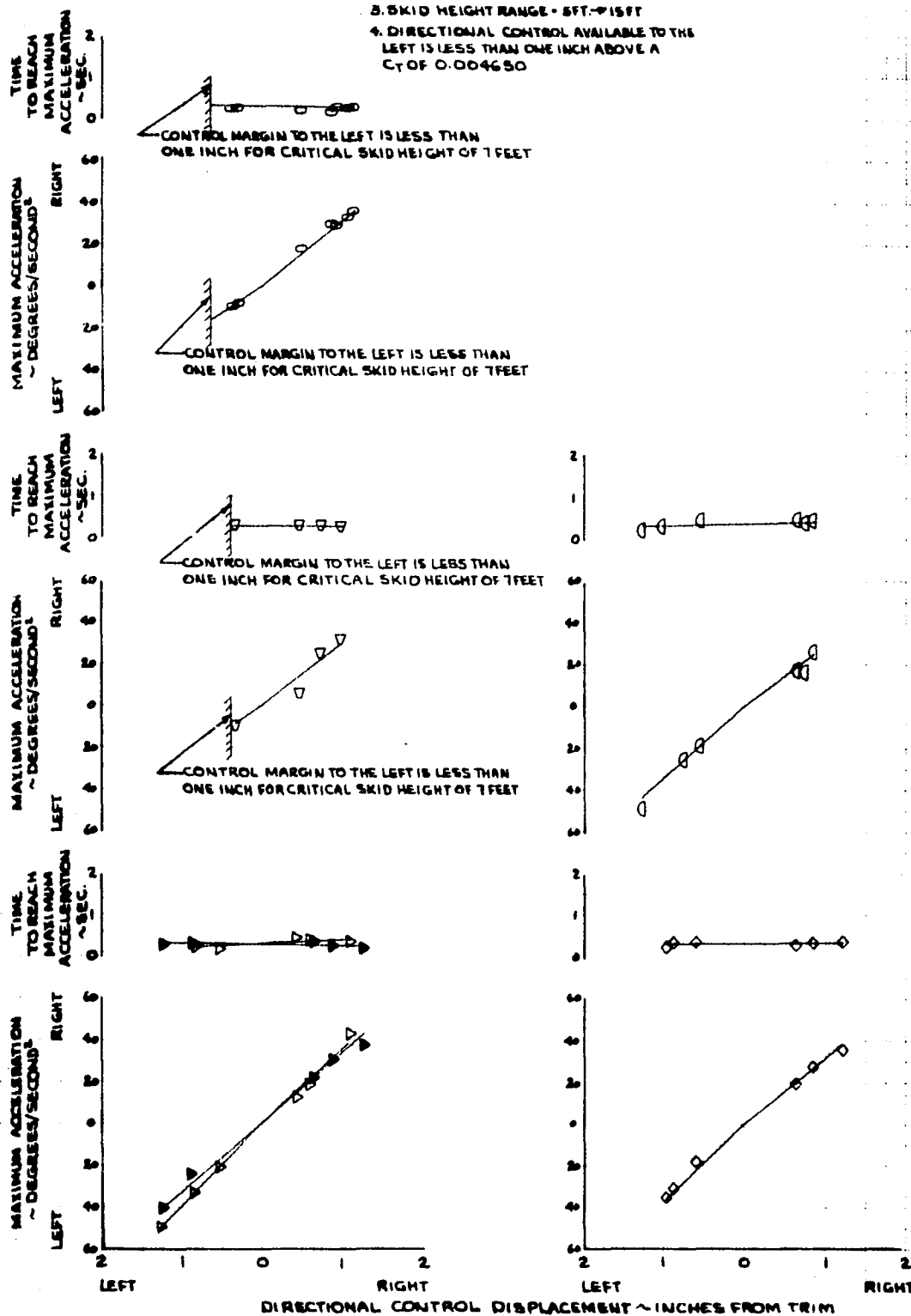
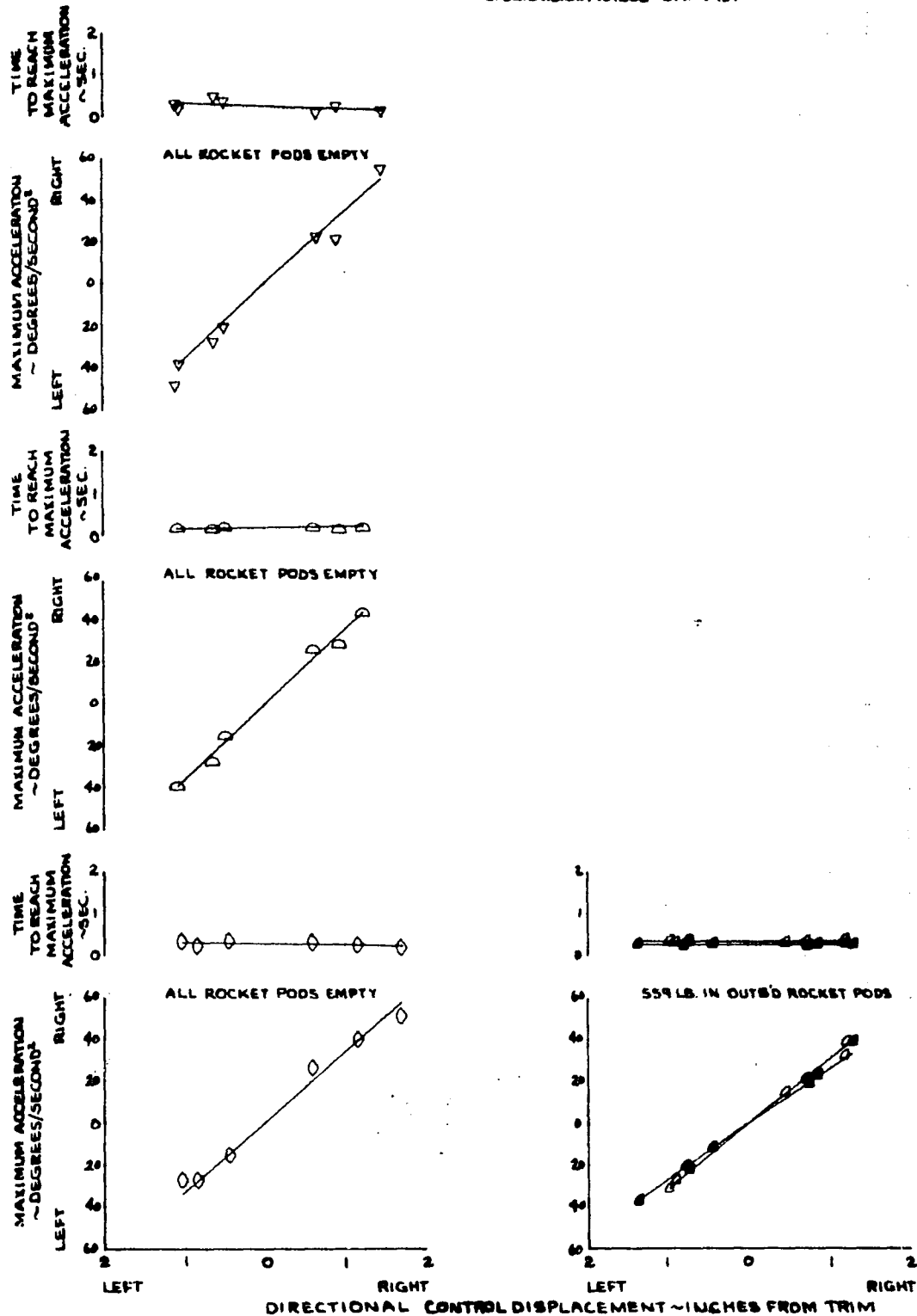


FIGURE No. 269 DIRECTIONAL CONTROL SENSITIVITY AH-1G USAF 616847

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
▽	-480	8460	195.9 (RN)	323.0	HOVER	0.004159
△	-490	8400	195.8 (RN)	313.5		0.004341
○	SEA LEVEL	8770	200.4 (AP)	313.5		0.004461
□	060	8600	199.9 (AP)	323.0		0.004307

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE = 8 FT. → 15 FT.



AM-10 USA 8715695

Journal of Management Studies, 20(6), 791-806.

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT = 30 FEET



FIGURE No. 271 **DIRECTIONAL CONTROL RESPONSE** **AH-1G USAF 615247** **CLEAN CONFIGURATION**

SYMBOL	AVG. ALTITUDE ~ FT	AVG. G.M. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	4580	7280	195.6 (MID)	3230	HOVER	0.004168
○	4580	7220	195.6 (MID)	3145		0.004368
○	4710	8630	195.4 (MID)	3245		0.004425
○	4850	8400	195.2 (MID)	3145		0.005114
○	8550	7830	195.5 (MID)	3240		0.004718
○	8550	7270	195.4 (MID)	3145		0.004418

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF

3. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.004650

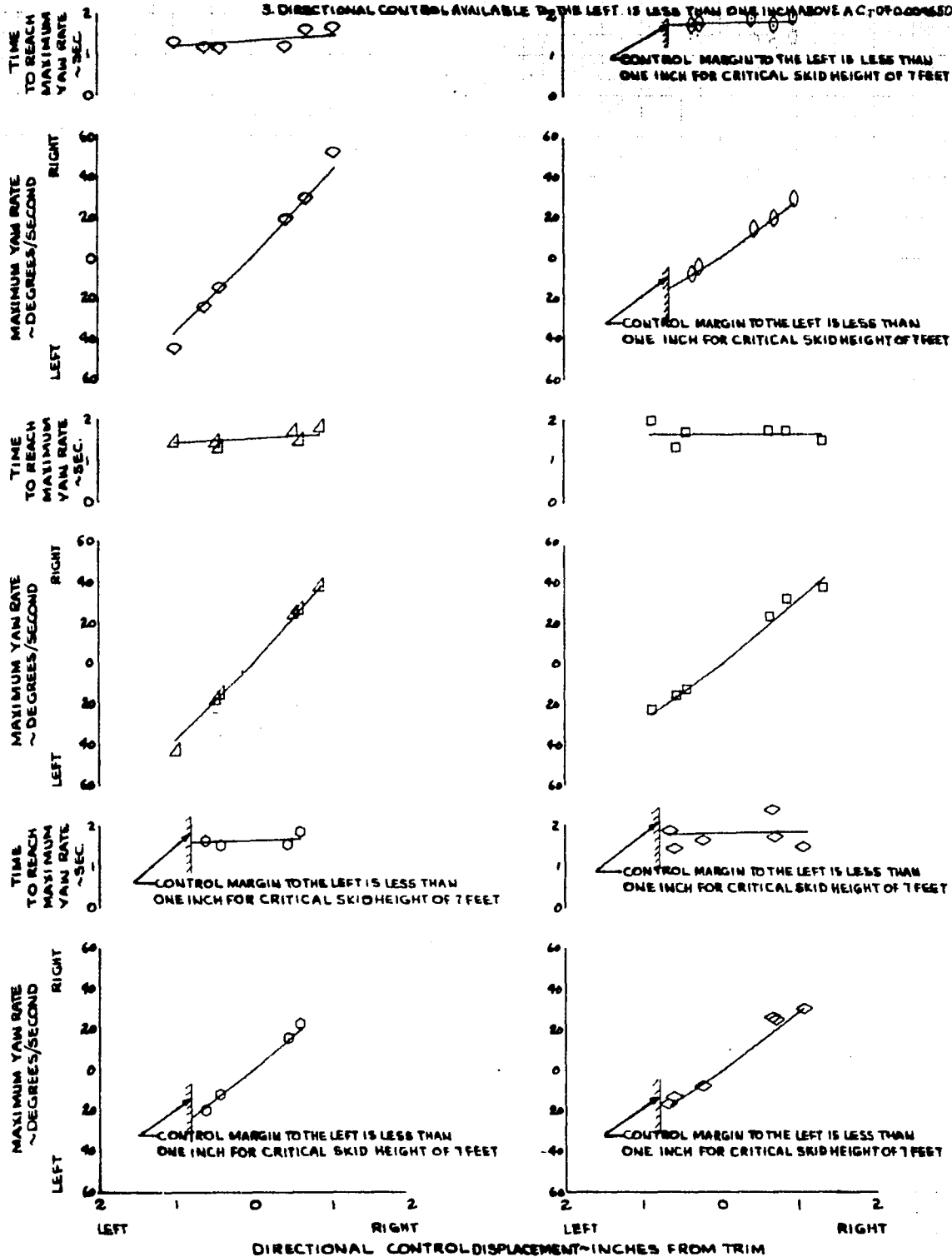







FIGURE NO. 272
DIRECTIONAL CONTROL RESPONSE
 AH-1G USA 64-18899
 CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H ₀ - FT.	AVG. G.M. ~L ₀	AVG. LONG. C-G - IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~C _T
	10320	7660	195.7	224.9	HOVER	0.000120
	10320	7490	195.7	218.5		0.000120
	550	7170	195.7	224.9		0.000120
	550	7160	195.7	218.5		0.000120
	250	6980	195.7	203.7		0.000120

- NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUM
 4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
 5. SKEW HEIGHT RANGES - 5 FT - 10 FT
 6. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS LESS THAN ONE INCH ABOVE A C_T OF 0.000620

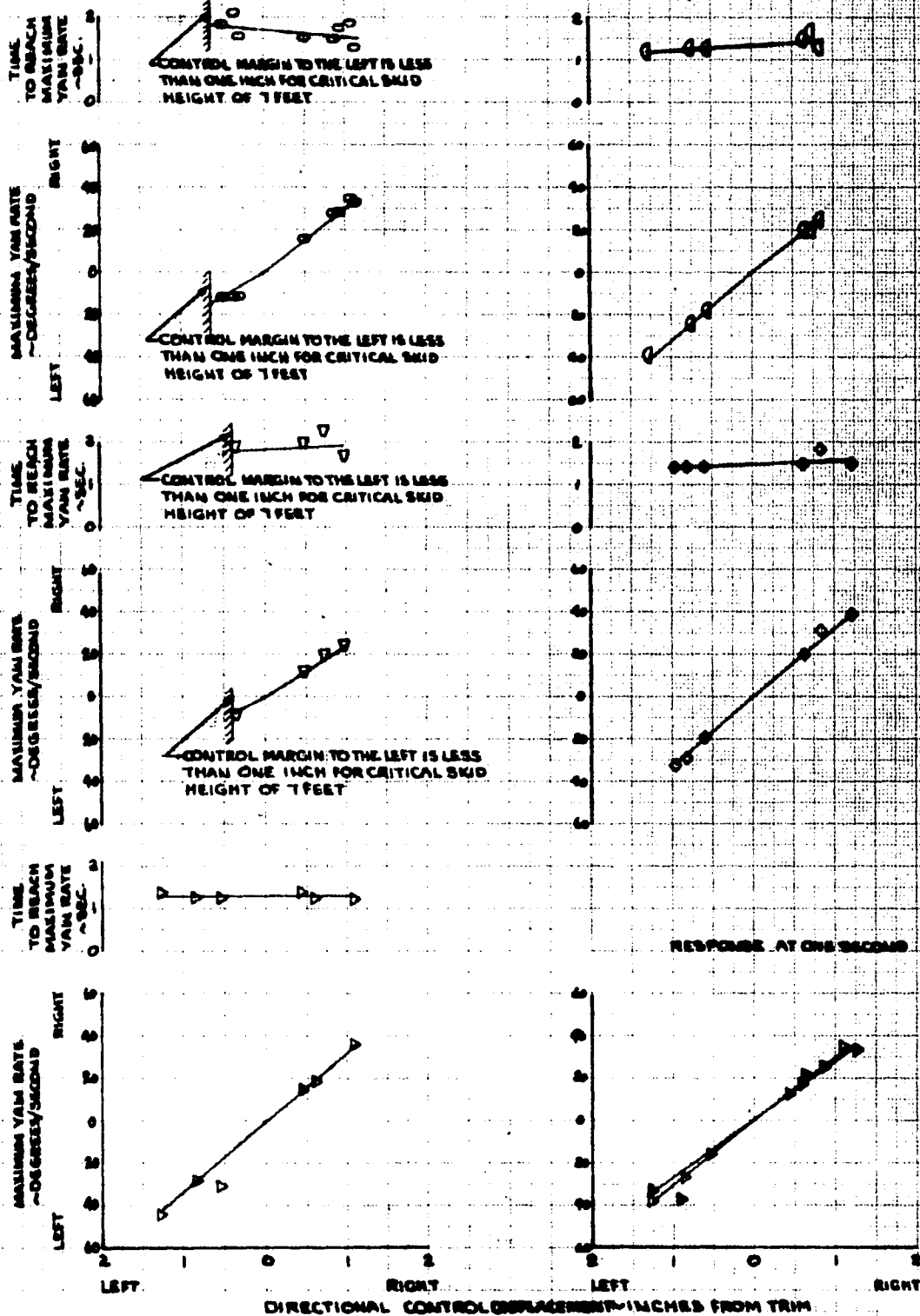


FIGURE No 273 DIRECTIONAL CONTROL RESPONSE

AM-1G USA 5418867
HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. CG ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF ~ C _T
○	-480	8460	195.9 (AM)	323.0	HOVER	0.00408
◊	-490	8400	195.8 (AM)	313.5		0.00401
◊	SEA LEVEL	8770	200.4 (AM)	313.5		0.00401
◊	060	8600	199.9 (AM)	323.0		0.00404

- NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. ALL SCAS ON RESPONSE VALUES ARE MAXIMUMS
4. ALL SCAS OFF RESPONSE VALUES READ AT ONE SECOND
5. SKID HEIGHT RANGE = 8 FT. → 15 FT.

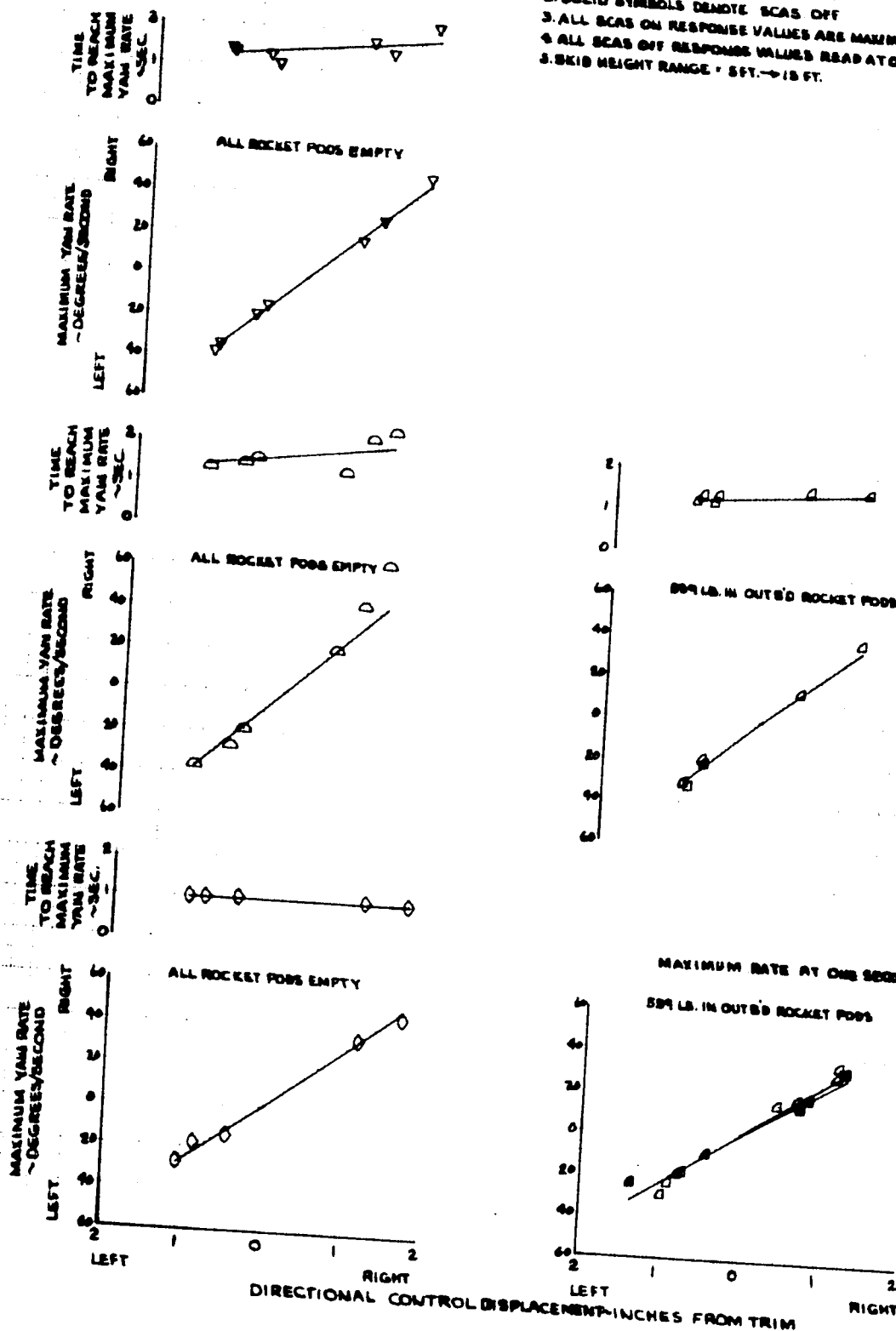


FIGURE NO. 274 **DIRECTIONAL CONTROL RESPONSE** **AH-1G USA 4/71SGRS**

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED
SCAS ON

SYM	AVG. ALT. ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
DO	980	7260	201.4 (AFT)	324.0	HOVER	0.003710
	450	8970	200.5 (AFT)	324.0	HOVER	0.004513

NOTE: SKID HEIGHT - 30 FEET

TIME
TO REACH
MAXIMUM
YAW RATE
~ SEC.

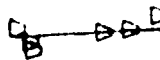
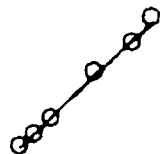
MAXIMUM YAW RATE
~ DEGREES/SECOND
RIGHT
LEFT

TIME
TO REACH
MAXIMUM
YAW RATE
~ SEC.

MAXIMUM YAW RATE
~ DEGREES/SECOND
RIGHT
LEFT



ALL ROCKET PODS EMPTY



817 LB. IN INBD ROCKET PODS
301 LB. IN OUT BD ROCKET PODS



DIRECTIONAL CONTROL DISPLACEMENT INCHES FROM TRIM

FIGURE NO. 275
DIRECTIONAL RESPONSE AT ONE SECOND
AH-1G USA 76715695

HVV. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
O	980	7260	201.4 (AFT)	324.0	HOVER	0.003710
D	450	8970	200.5 (AFT)	324.0	HOVER	0.004513

NOTE: SKID HEIGHT - 30 FEET

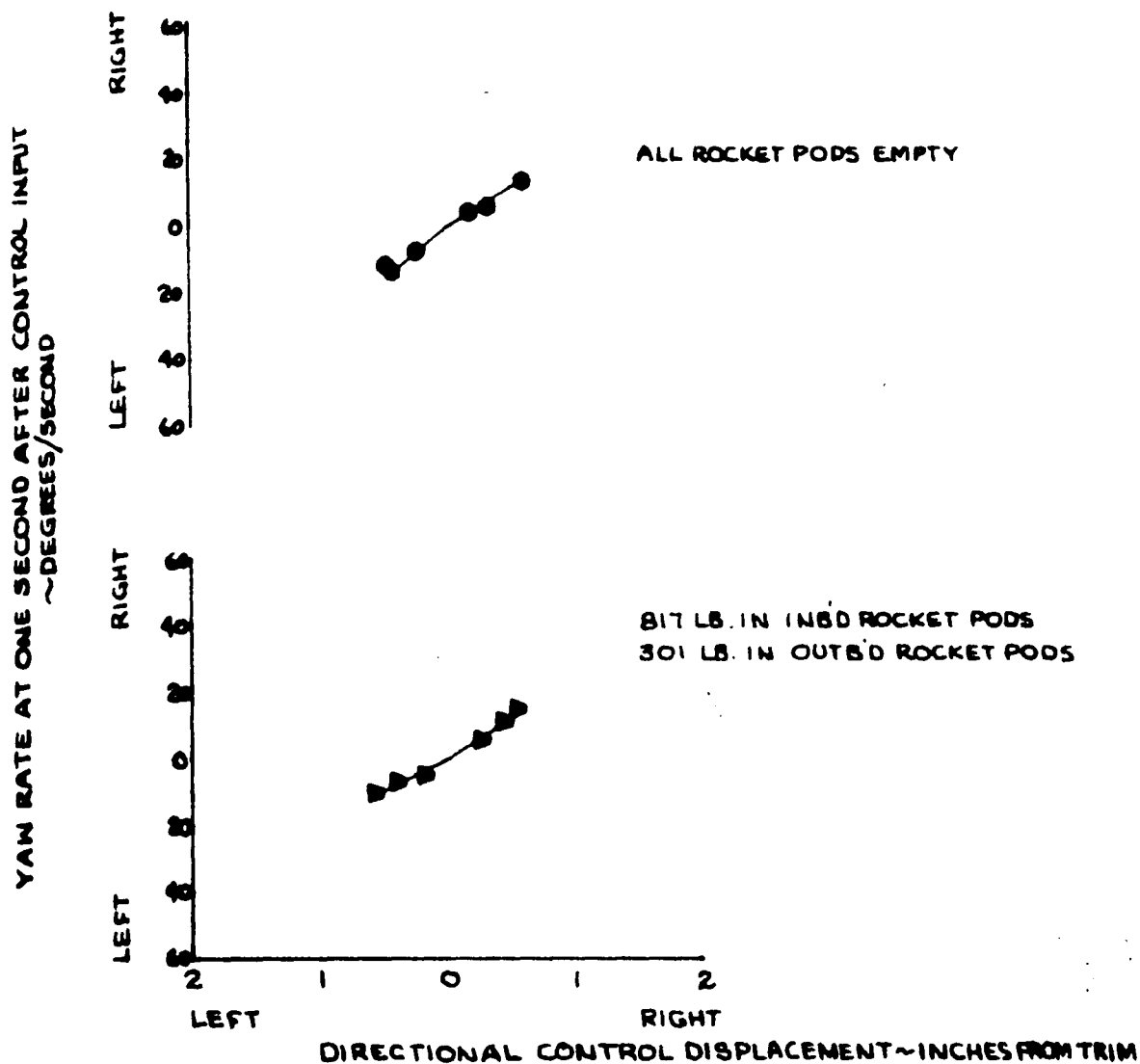


FIGURE NO. 276
ANGULAR YAW DISPLACEMENT
AH-1G USA 6418897
CLEAN CONFIGURATION

SYMBOL	AVG. ALTITUDE H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
○	10320	7560	1957 (MID)	326.0	HOVER	0.00377
○	10320	7490	1956 (MID)	313.5		0.00347
○	560	7170	1952 (MID)	326.0		0.00328
○	560	7160	1951 (MID)	313.5		0.00288
◇	570	6980	1949 (MID)	303.5		0.004816

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT RANGE = 5 FT. → 15 FT.
4. DIRECTIONAL CONTROL AVAILABLE TO
THE LEFT IS LESS THAN ONE INCH
ABOVE A C_T OF 0.004650

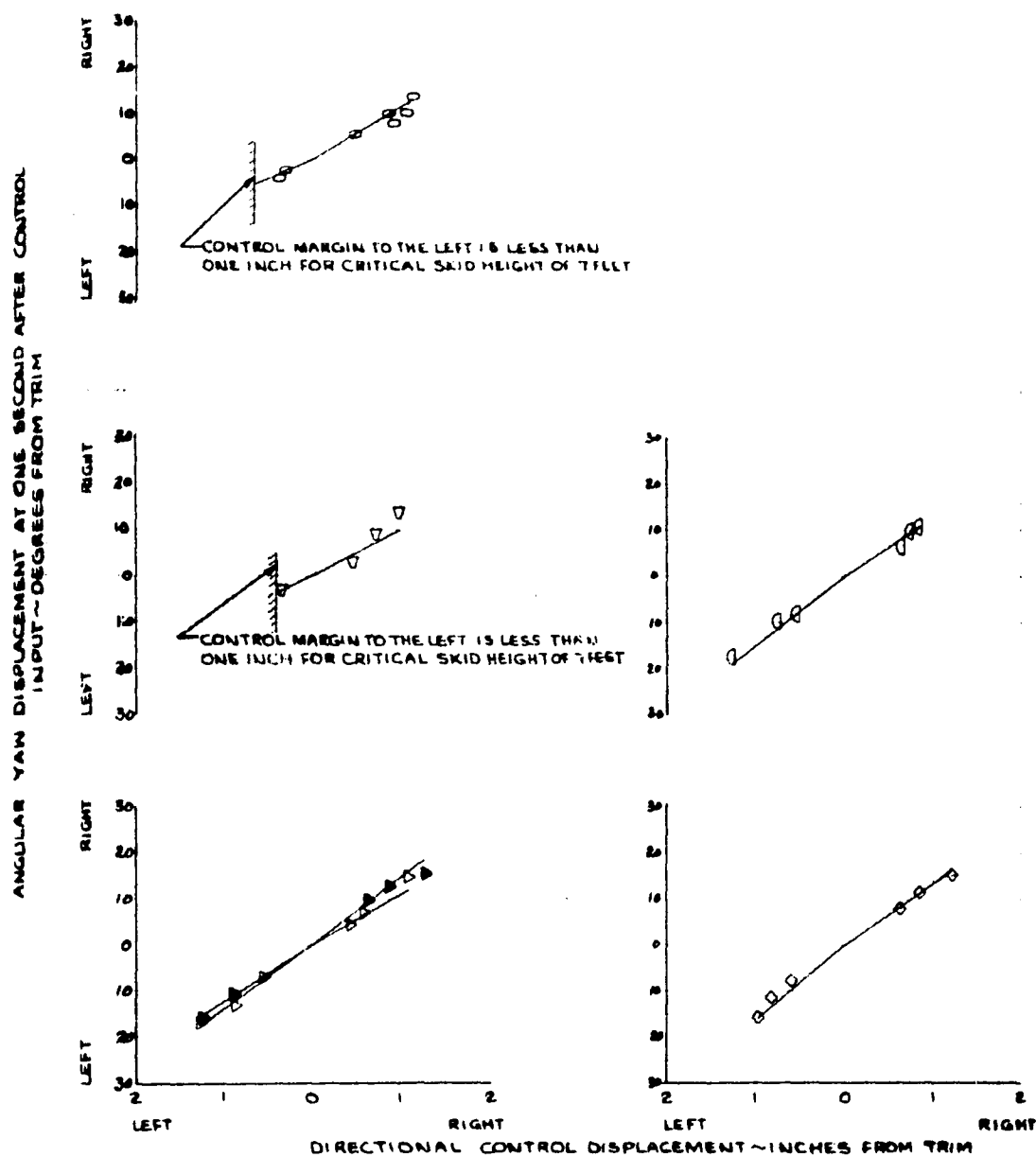


FIGURE NO. 277
ANGULAR YAW DISPLACEMENT
 AH-1G USAF 101ST
 CLEAN CONFIGURATION
 SCAS ON

SYMBOL	AVG. ALTITUDE ~ FT.	AVG. G.N. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF ~ C _T
000000	4500	7200	1956 (MID)	323.0	HOVER ↓	0.004100
	4500	7200	1956 (MID)	310.5		0.004200
	4700	8000	1954 (MID)	324.5		0.004000
	4800	8000	1952 (MID)	310.5		0.004110
	5100	7800	1955 (MID)	324.0		0.004010
	5100	7270	1954 (MID)	314.5		0.004000

NOTES: 1. SKID HEIGHT RANGE - 5 FT. - 15 FT.
 2. DIRECTIONAL CONTROL AVAILABLE TO THE LEFT IS
 LESS THAN ONE INCH ABOVE A C_T OF 0.004600

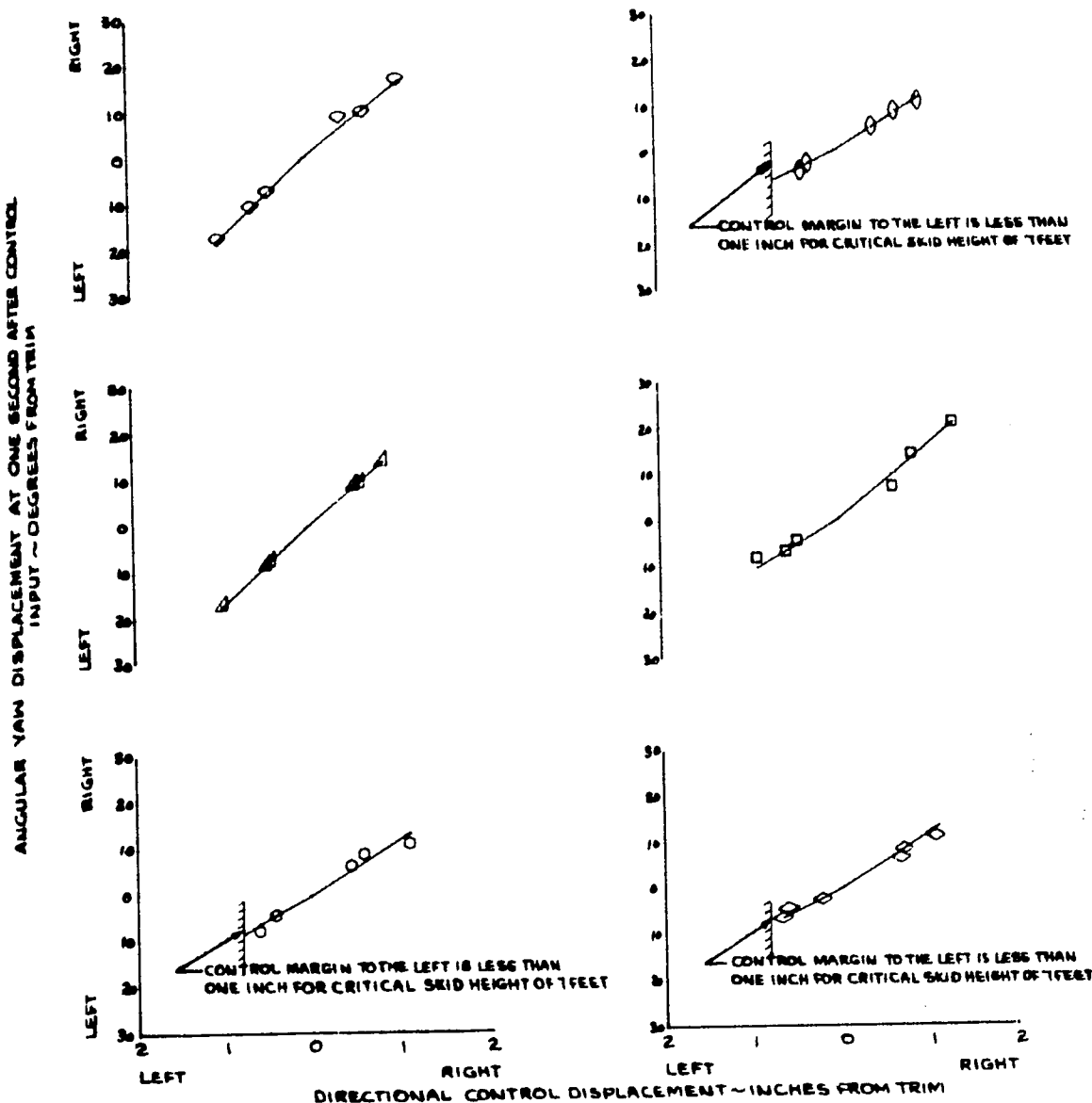


FIGURE NO. 278
ANGULAR YAW DISPLACEMENT.
AH-1G USA 1618847

HVV HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYMBOL	AVG. ALTITUDE H ₀ ~ FT.	AVG. G.W. ~ LB.	AVG. LONG. C.G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
△	-480	8460	198.9 (MID)	3280	HOVER	0.000168
○	-450	8400	198.8 (MID)	318.5		0.000281
●	SEA LEVEL	8710	206.4 (MID)	318.5		0.000581
◻	060	8600	199.9 (MID)	328.0		0.000504

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
 2. SOLID SYMBOLS DENOTE SCAS OFF
 3. SKID HEIGHT RANGE = 5 FT. → 15 FT.

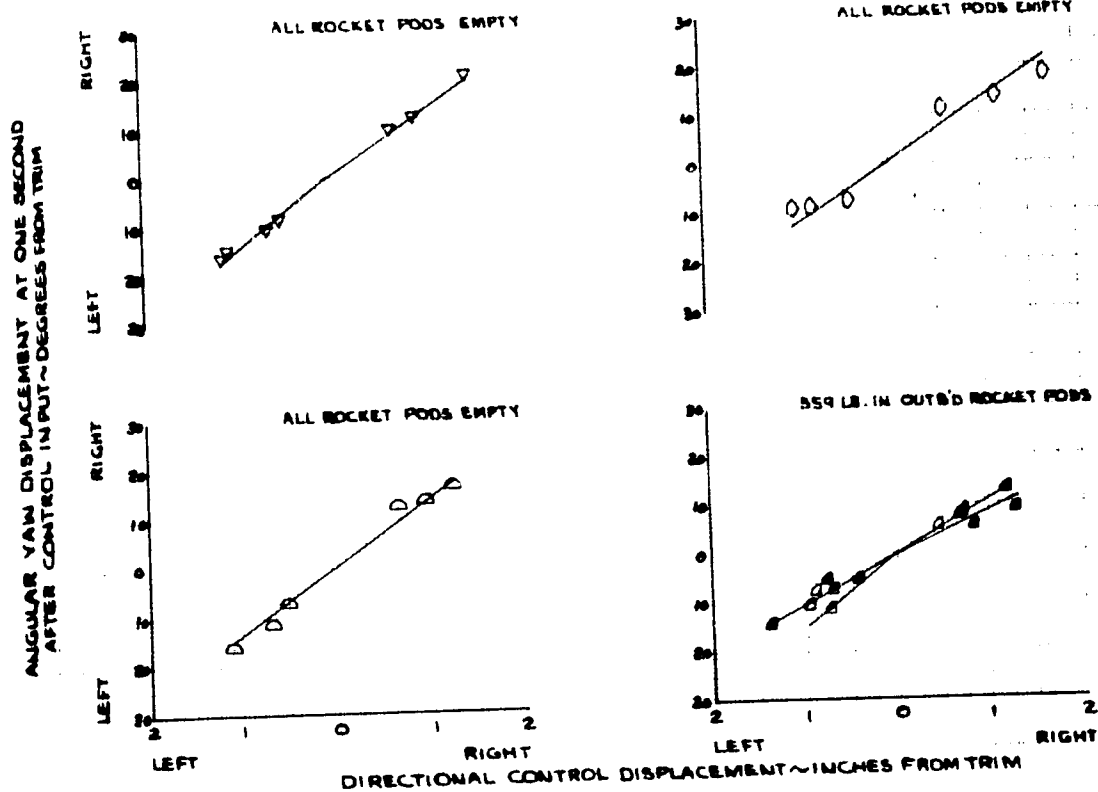


FIGURE NO. 279 **ANGULAR YAW DISPLACEMENT**

AH-1G USAF 715695

HVY. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

SYM.	AVG. ALT. H _D ~ FT.	AVG. G. W. ~ LB.	AVG. LONG. C. G. ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ C _T
O	980	7260	201.4 (AFT)	324.0	HOVER	0.003710
D	450	8970	200.5 (AFT)	324.0	HOVER	0.004918

NOTES: 1. OPEN SYMBOLS DENOTE SCAS ON
2. SOLID SYMBOLS DENOTE SCAS OFF
3. SKID HEIGHT = 30 FEET

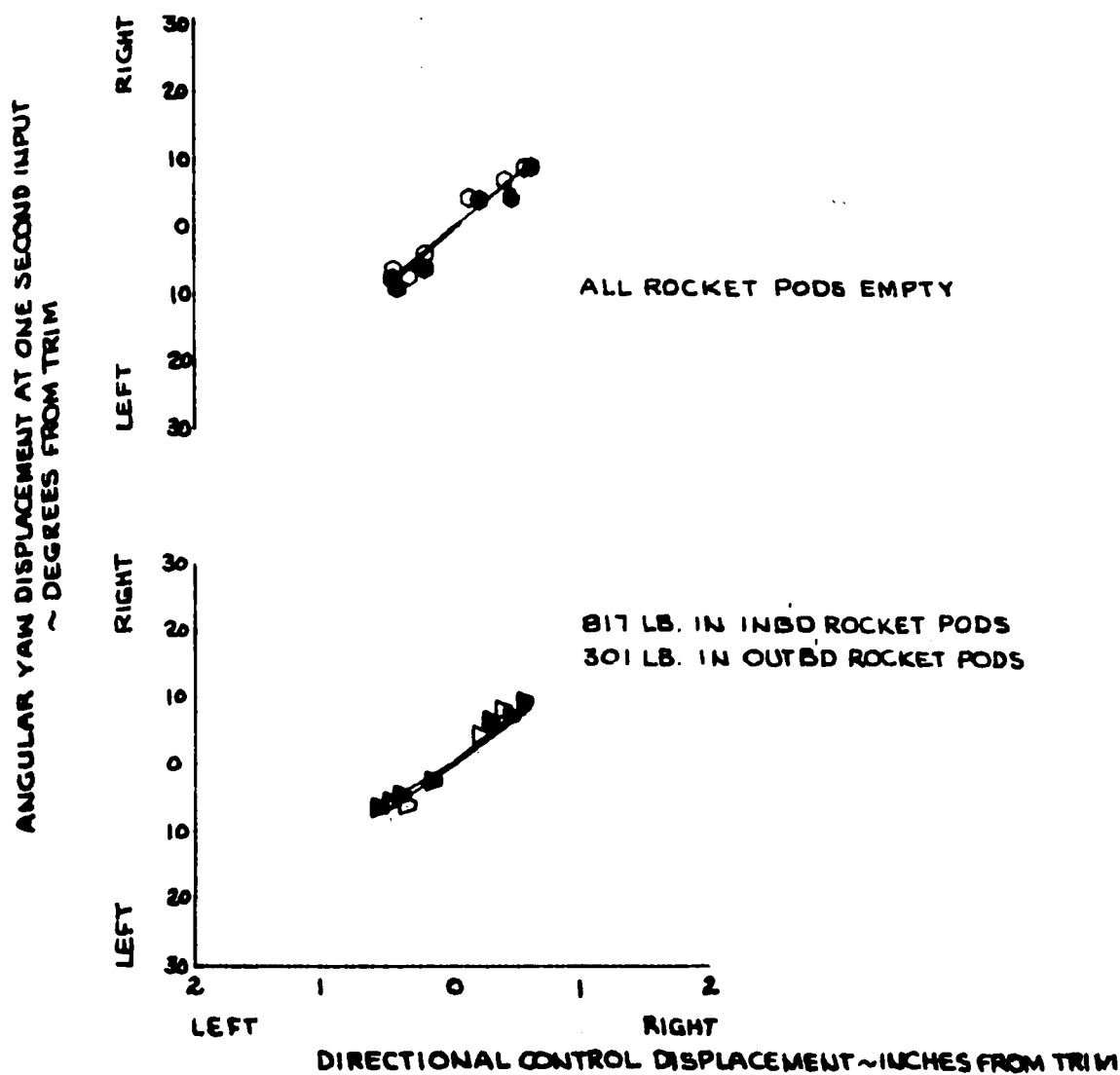


FIGURE NO.280 AFT LONGITUDINAL STEP SCAS ON

AH-1G USAF 6715695
CLEAN CONFIGURATION

AIR SPEED 65~KCAS ALTITUDE(Ht) 4000~FT GROSS WEIGHT 7540~LB LONG.C.G. 201(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT.

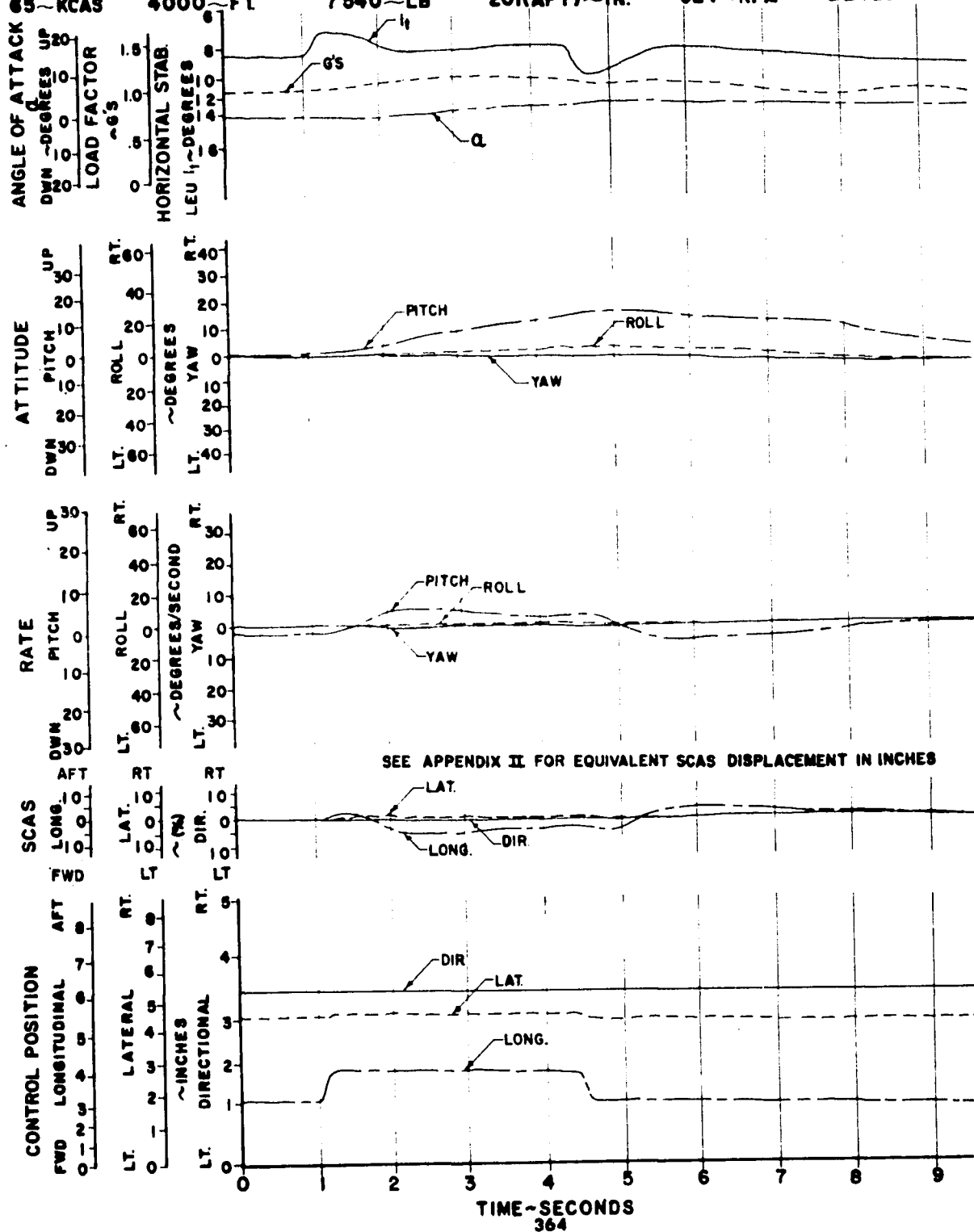


FIGURE NO. 281 FWD LONGITUDINAL STEP SCAS ON

AH-1G USAF 6715695
CLEAN CONFIGURATION

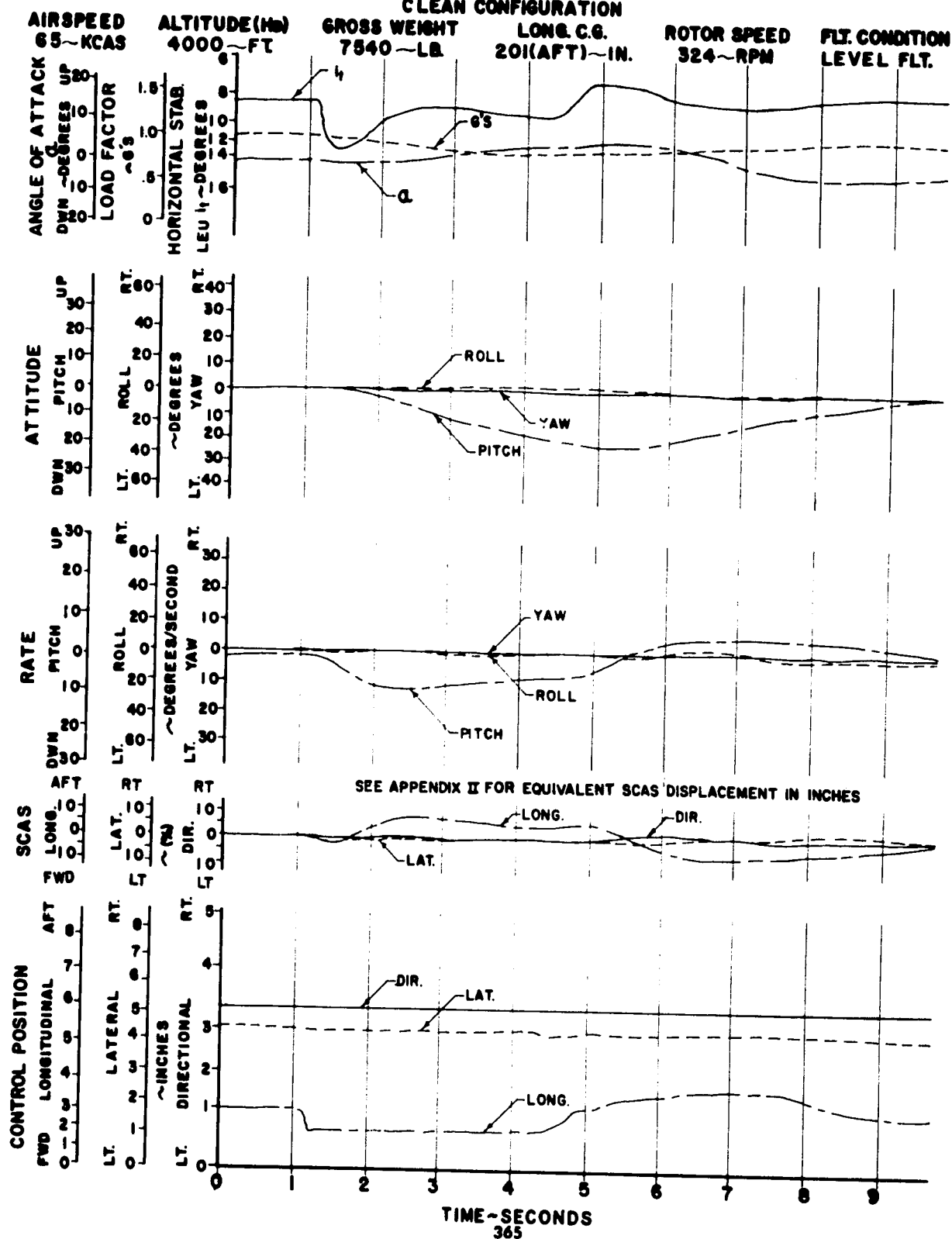


FIGURE NO. 282 RIGHT LATERAL STEP SCAS ON

AH-1G USA #6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 105~KCAS ALTITUDE(H) 3700~FT GROSS WEIGHT 7620~LB LONG.C.G. 201(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT.

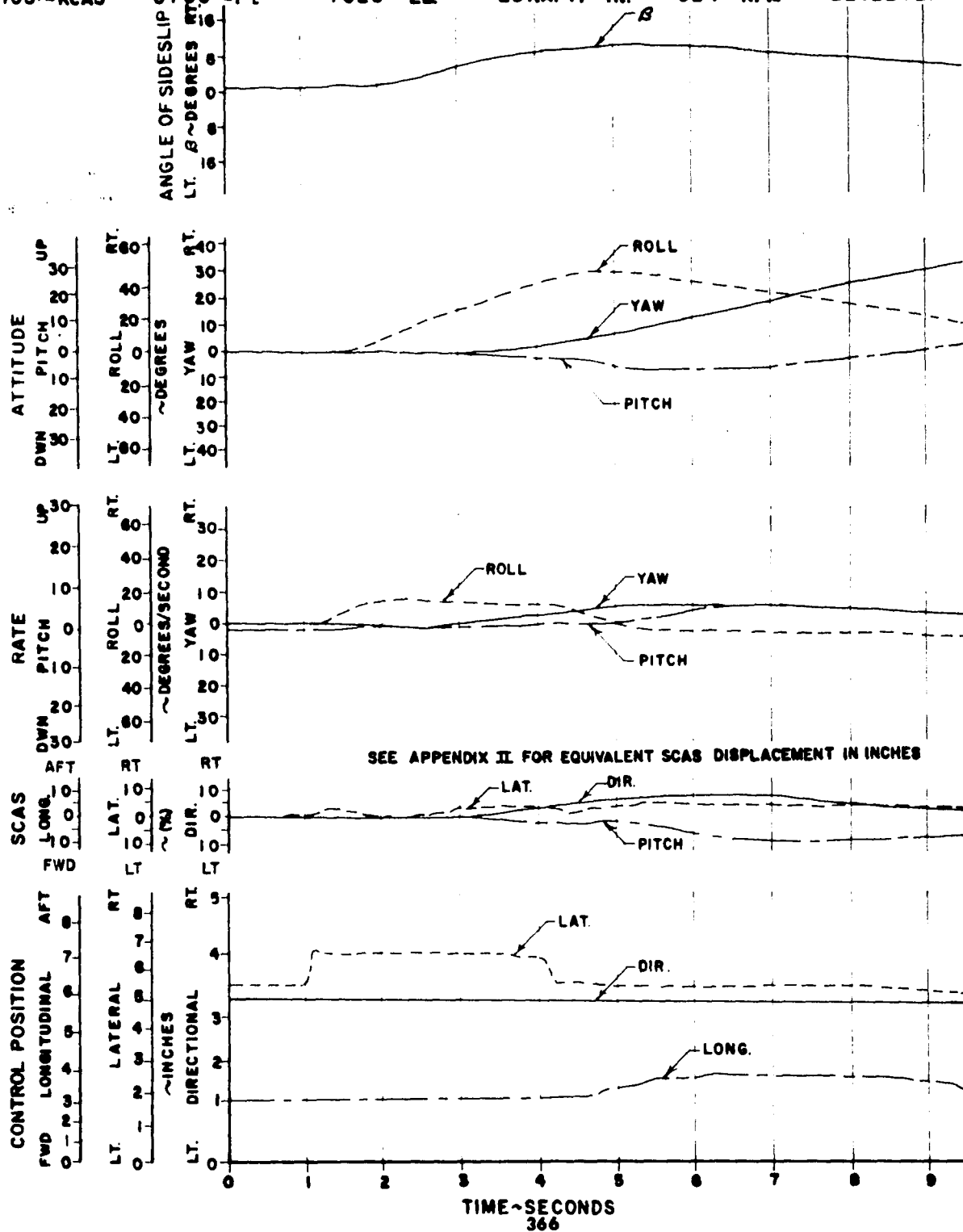


FIGURE NO. 283 LEFT LATERAL STEP SCAS ON

AH-1G USA 6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED
105~KCAS

ALTITUDE(Hg)
3700~FT

GROSS WEIGHT
7130~LB

LONG.C.G.
201(AFT)~IN.

ROTOR SPEED
324~RPM

FLT. CONDITION
LEVEL FLT.

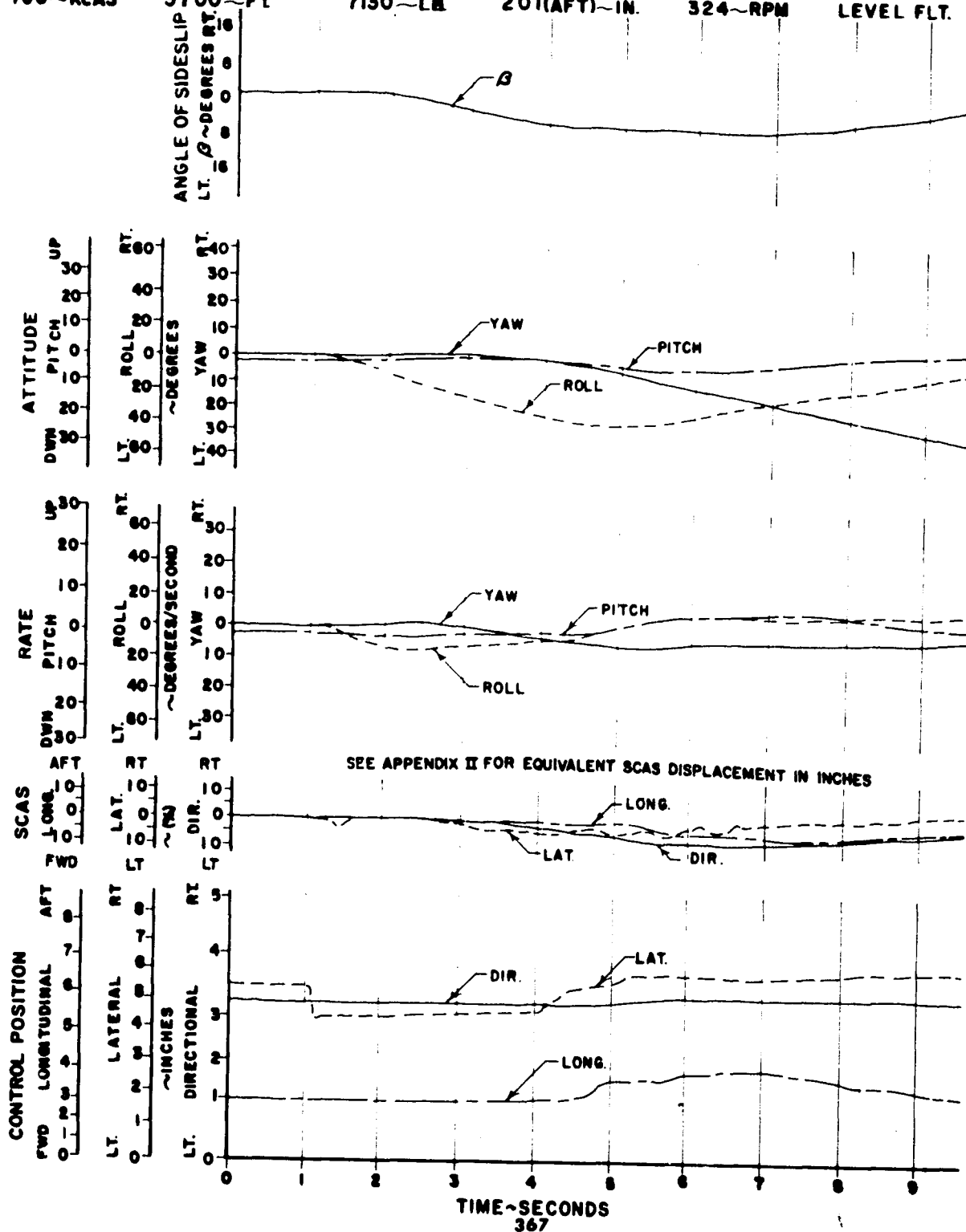


FIGURE NO. 284 RIGHT DIRECTIONAL STEP SCAS ON

AH-1G USA #6715695

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPED	ALTITUDE(M)	GROSS WEIGHT	LONG.C.G.	ROTOR SPEED	FLY CONDITION
55~KCAS	15400~FT	7620~LB	201(AFT)~IN.	324~RPM	LEVEL FLT.

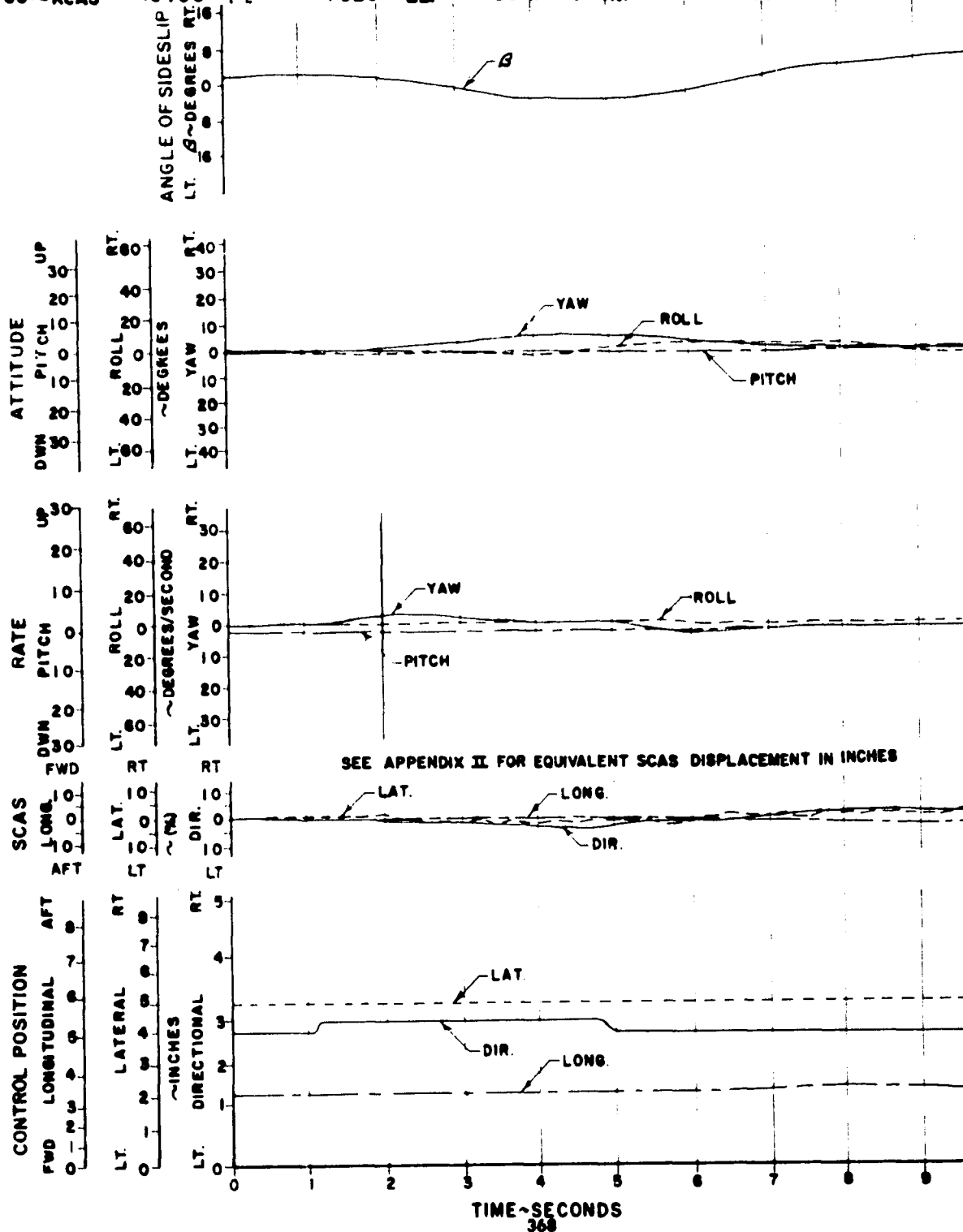


FIGURE NO. 285 LEFT DIRECTIONAL STEP SCAS ON

AM-1G USA 46715695
HVY. HOG CONFIGURATION (UNFAIRED)

AIRSPED 55~KCAS ALTITUDE(Hb) 15400~FT GROSS WEIGHT 7620~LB LONG.C.G. 20(AFT)~IN. ROTOR SPEED 324~RPM FLT.CONDITION LEVEL FLT.

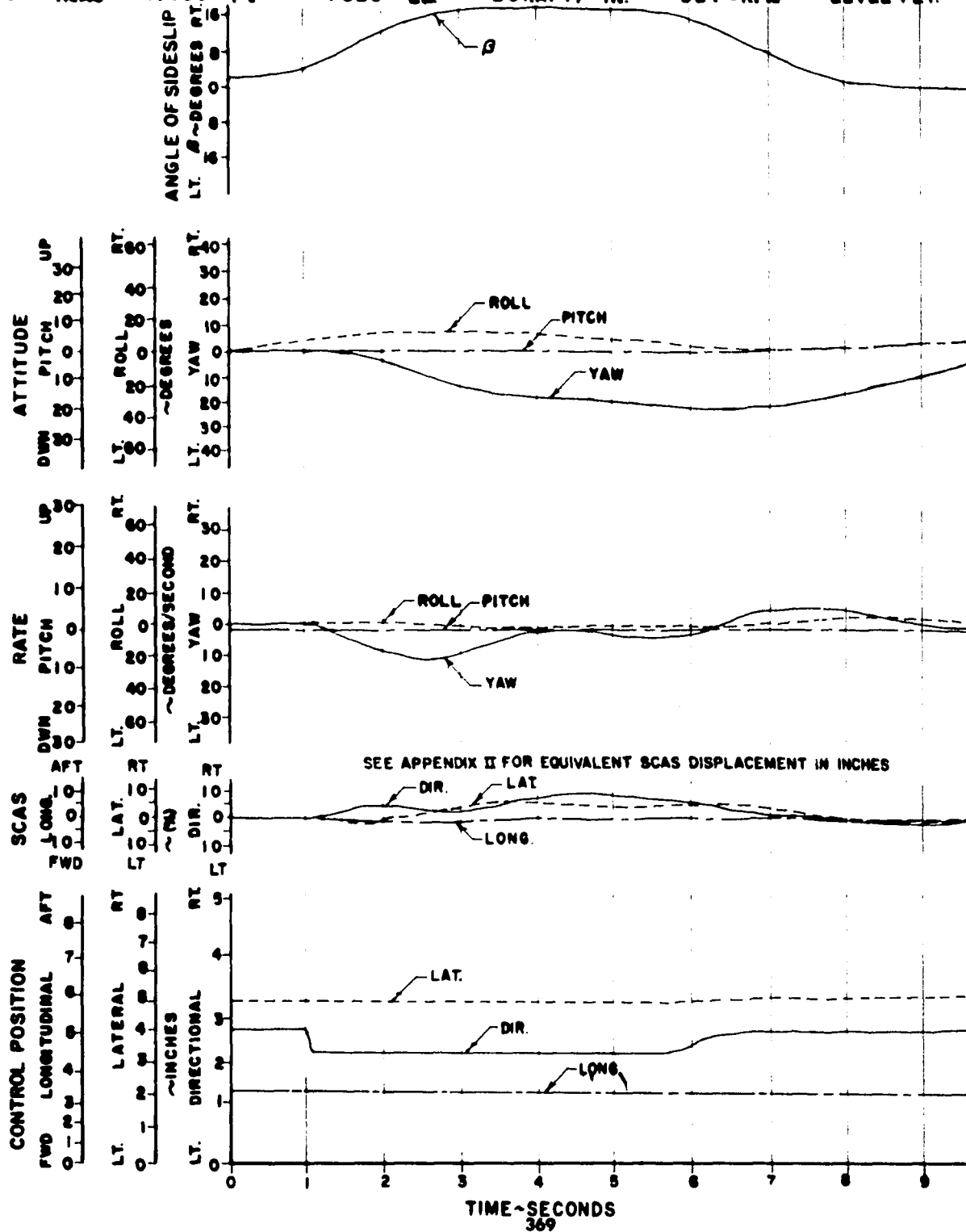


FIGURE NO. 286 LEFT DIRECTIONAL STEP SCAS ON

AH-1G USA 76615247
CLEAN CONFIGURATION

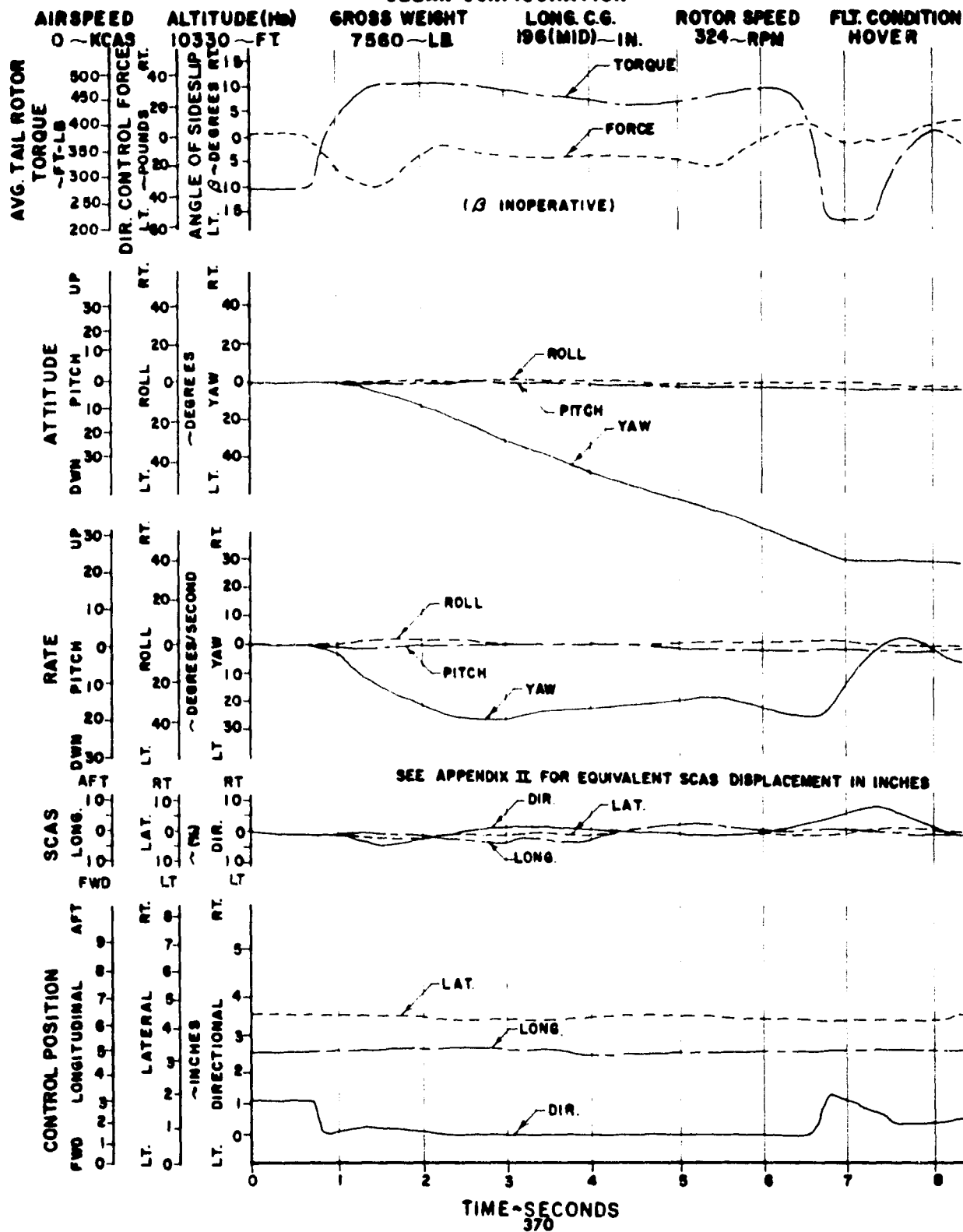


FIGURE No. 287
DIFFERENTIAL TAIL ROTOR HORSEPOWER ENCOUNTERED DURING DIRECTIONAL INPUTS
 AH-1G USAF 613247
 CLEAN CONFIGURATION

SYM	DENSITY ALTITUDE H ₀ ~ FT.	GROSS WEIGHT ~ LB.	LONG. CG ~ IN.	ROTOR RPM	FLT. COND.	THRUST COEFF. ~ C _T
0	4700	8680	195.4(MID)	3245	HOVER	0.004927
0	4850	8400	195.2(MID)	3145		0.005114
0	10820	7860	195.7(MID)	3240		0.005185
7	10820	7490	195.6(MID)	3135		0.005484

- NOTES: 1. ALL DATA GATHERED WITH AIRCRAFT IN GROUND EFFECT
 2. MID HEIGHT RANGE - 5 FT. - 15 FT.
 3. SOLID SYMBOLS DENOTE AVERAGE TAIL ROTOR HORSEPOWER
 4. OPEN SYMBOLS DENOTE PEAK TAIL ROTOR HORSEPOWER
 5. SOLID LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER
 RESULTING FROM INITIAL CONTROL INPUT
 6. DASHED LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER
 RESULTING FROM RECOVERY INPUT
 7. DIFFERENTIAL TAIL ROTOR HORSEPOWER IS EQUAL TO TAIL ROTOR
 HORSEPOWER RESULTING FROM INPUT MINUS TAIL ROTOR HORSEPOWER
 FOR A TRIMMED HOVER CONDITION

DIFFERENTIAL TAIL ROTOR HORSEPOWER
~ HP

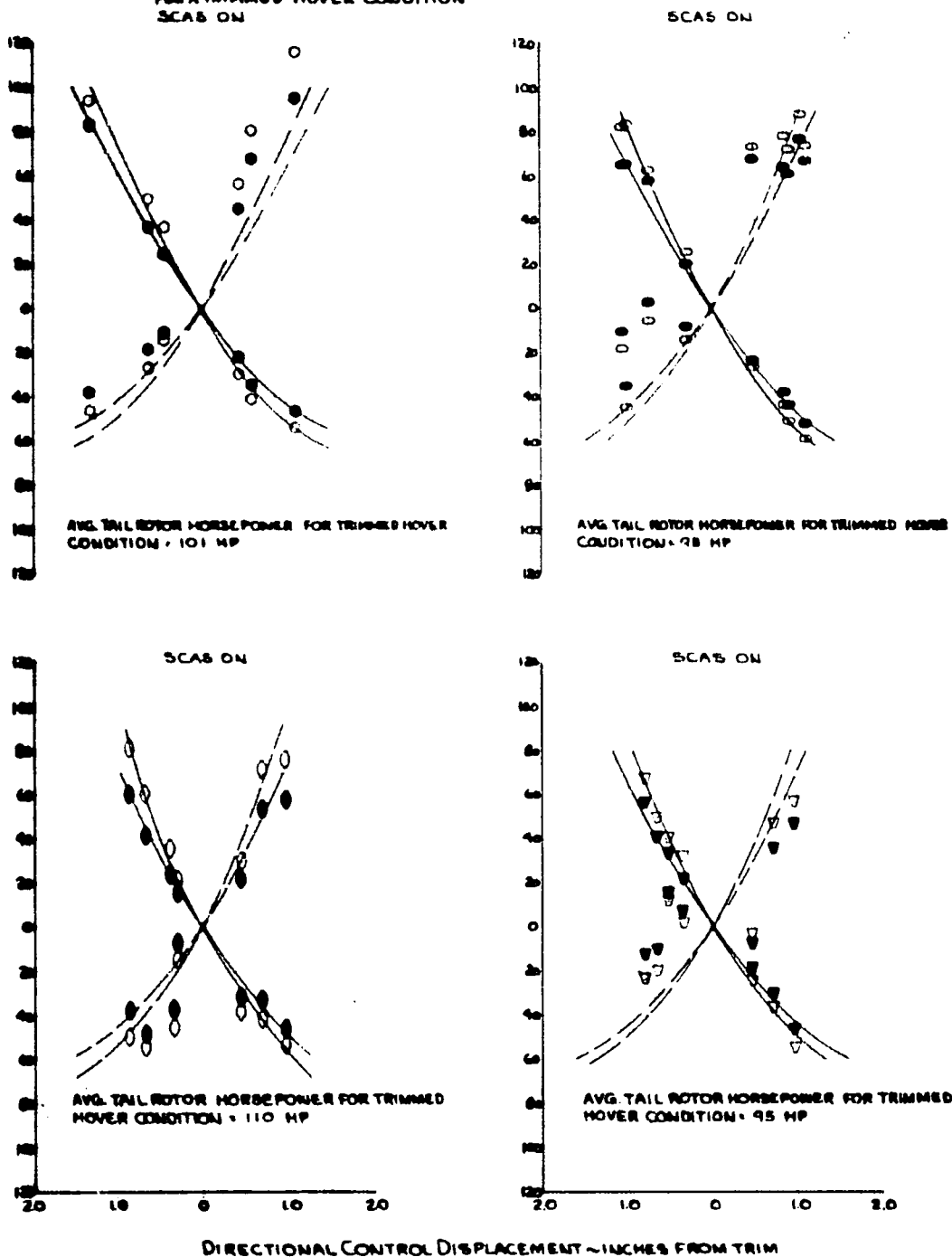


FIGURE NO 288
 DIFFERENTIAL TAIL ROTOR HORSEPOWER ENCOUNTERED DURING DIRECTIONAL INPUTS
 AH-1G USA 7618247
 CLEAN CONFIGURATION

SYM.	DENSITY ALTITUDE H ₀ ~ FT.	GEOS. HEIGHT ~ LB.	LONGCS. ~ IN.	ROTOR RPM	FLY COND.	THRUST COEFF. ~ C _T
○	4580	7290	1954 (MID)	3250	HOVER	0.004168
△	4580	7220	1956 (MID)	3145		0.004360
□	4580	7320	1955 (MID)	3210		0.004184
◇	4580	7270	1954 (MID)	3195		0.004489

- NOTES: 1. ALL DATA GATHERED WITH AIRCRAFT IN GROUND EFFECT
 2. SKID HEIGHT RANGE = 5 FT. → 15 FT.
 3. SOLID SYMBOLS DENOTE AVERAGE TAIL ROTOR HORSEPOWER
 4. OPEN SYMBOLS DENOTE PEAK TAIL ROTOR HORSEPOWER
 5. SOLID LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM INITIAL CONTROL INPUT
 6. DASHED LINE DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER RESULTING FROM RECOVERY
 7. DIFFERENTIAL TAIL ROTOR HORSEPOWER IS EQUAL TOTAL ROTOR HORSEPOWER RESULTING FROM INPUT MINUS TAIL ROTOR HORSEPOWER FOR A TRIMMED HOVER CONDITION

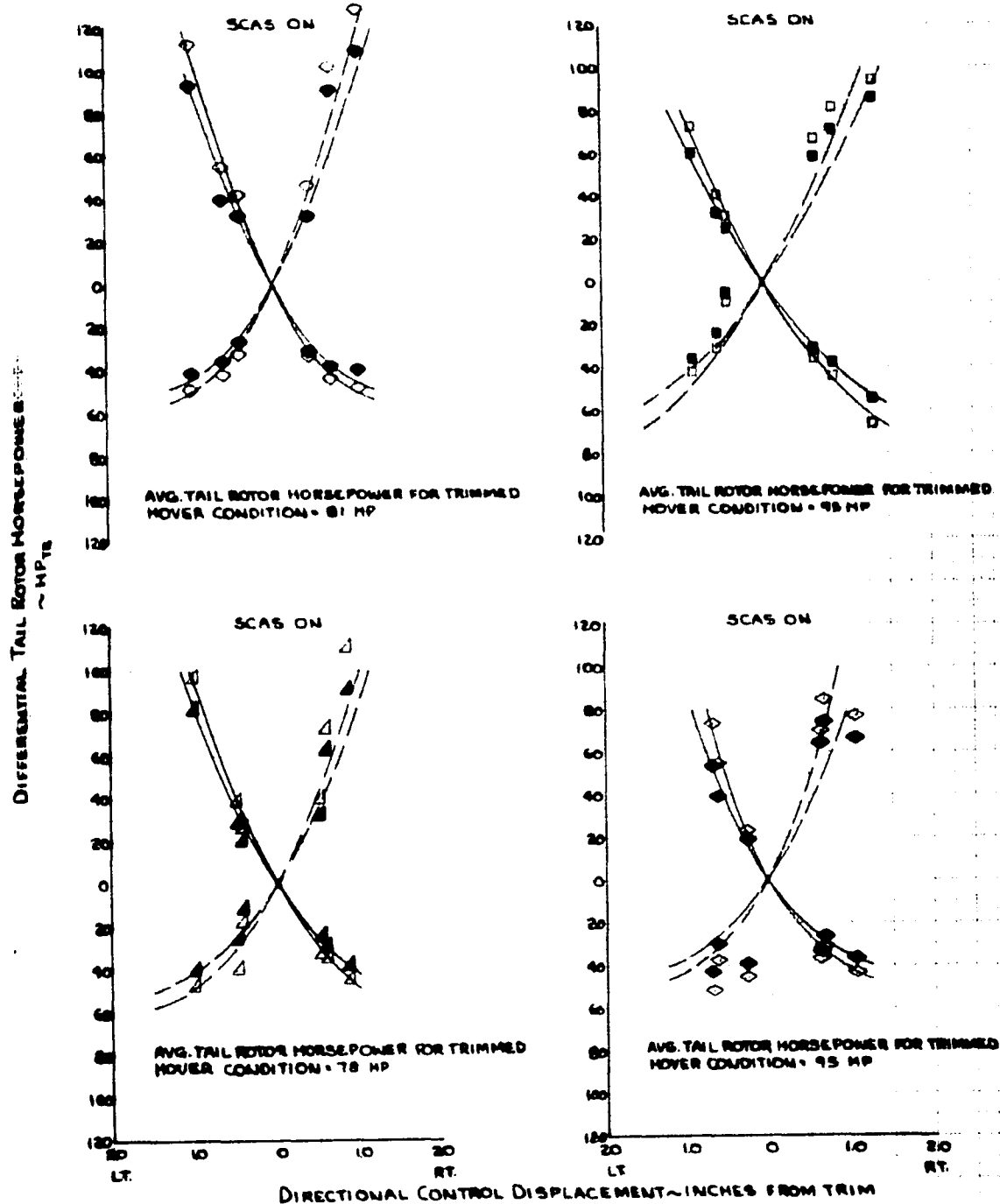


FIGURE No. 289
DIFFERENTIAL TAIL ROTOR HORSEPOWER ENCOUNTERED DURING DIRECTIONAL INPUTS
 AH-1G USAF 618247
 CLEAN CONFIGURATION

SYM	DENSITY ALTITUDE MO ~ FT.	GROUND HEIGHT ~ LB.	WINDSPEED ~ IN.	ROTOR RPM	FLIGHT COND.	THRUST COEFF. ~ CT
Δ	360	1130	105.2 (MID)	534.0	HOVER	0.008518
△	360	1130	105.2 (MID)	534.0		0.008418
○	550	1160	105.1 (MID)	518.5		0.008899
◊	570	1180	104.9 (MID)	518.5		0.009017

- NOTES: 1. ALL DATA GATHERED WITH AIRCRAFT IN GROUND EFFECT
 2. SKID HEIGHT RANGE - 5 FT - 15 FT.
 3. SOLID SYMBOLS DENOTE AVERAGE TAIL ROTOR HORSEPOWER
 4. OPEN SYMBOLS DENOTE PEAK TAIL ROTOR HORSEPOWER
 5. SOLID LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER
 RESULTING FROM INITIAL CONTROL INPUT
 6. DASHED LINES DENOTE DIFFERENTIAL TAIL ROTOR HORSEPOWER
 RESULTING FROM RECOVERY
 7. DIFFERENTIAL TAIL ROTOR HORSEPOWER IS EQUAL TO TAIL ROTOR
 HORSEPOWER RESULTING FROM INPUT MINUS TAIL ROTOR HORSEPOWER
 FOR A TRIMMED HOVER CONDITION

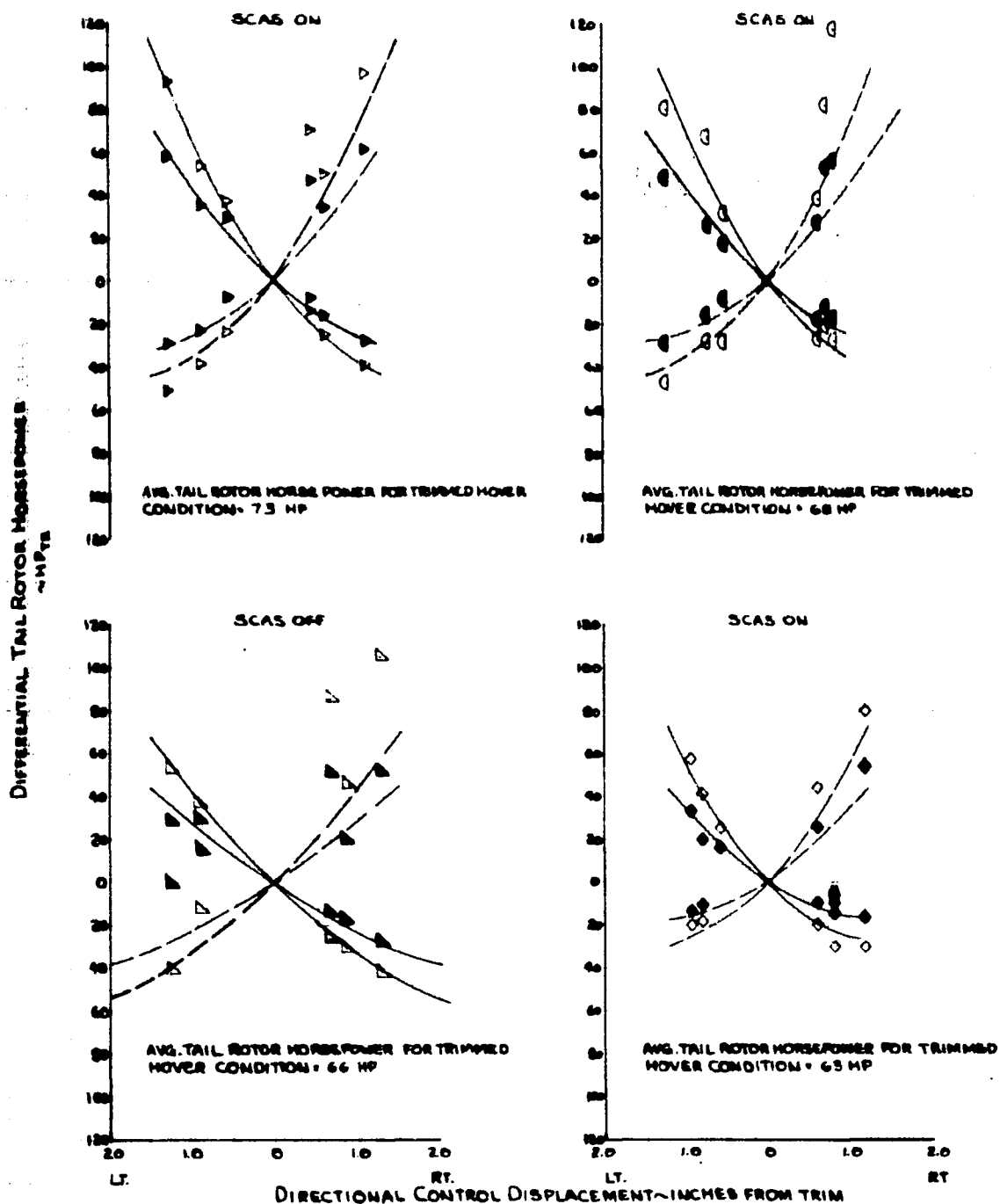


FIGURE No. 290
SUMMARY OF STICK FIXED AND STICK FREE
MANEUVERING STABILITY
AH-1G USA 4615247
CLEAN CONFIGURATION

SYM	AVG. AIRSPEED V _C ~ KCAS	AVG. GROSS WEIGHT ~ LB
○	138	7800
□	138	7000
△	117	7800
△	117	7000

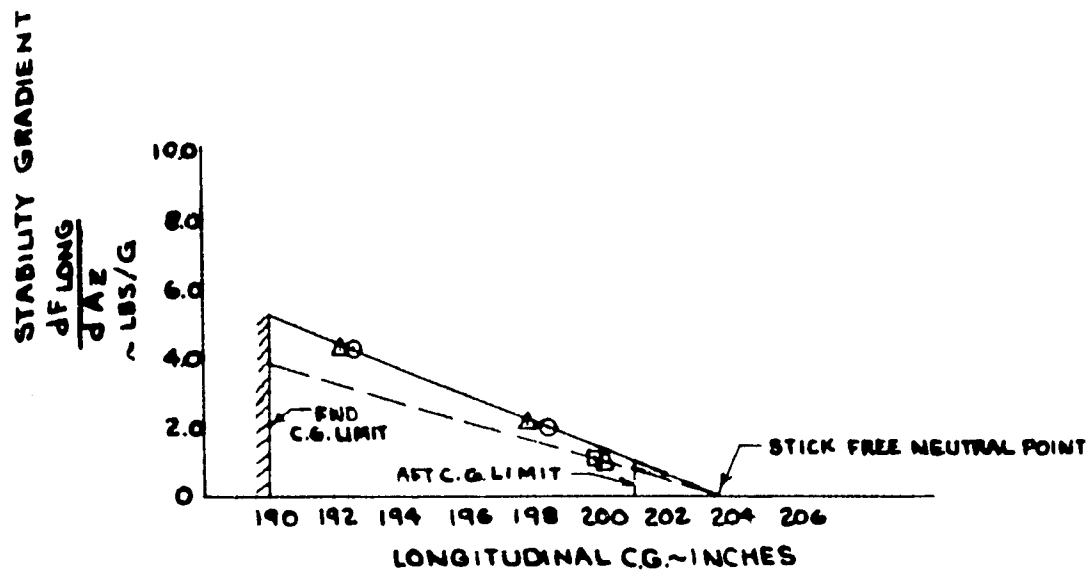
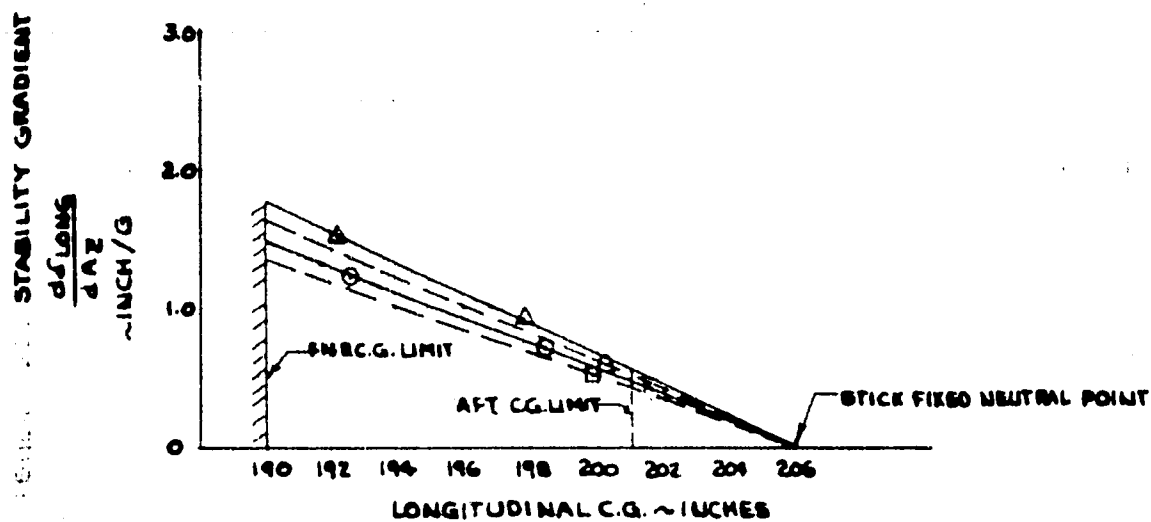


FIGURE No. 291
MANEUVERING STABILITY
AH-1G USA 6615247
CLEAN CONFIGURATION

NOTES: 1.0 DENOTES LEFT WIND-UP TURN
2.0 DENOTES RIGHT WIND-UP TURN
3.0 DENOTES SYMMETRICAL PULL-UP
4. CYCLIC FORCE TRIM ON
5. LONGITUDINAL CONTROL FORCE
MEASURED AT CENTER OF HAND GRIP

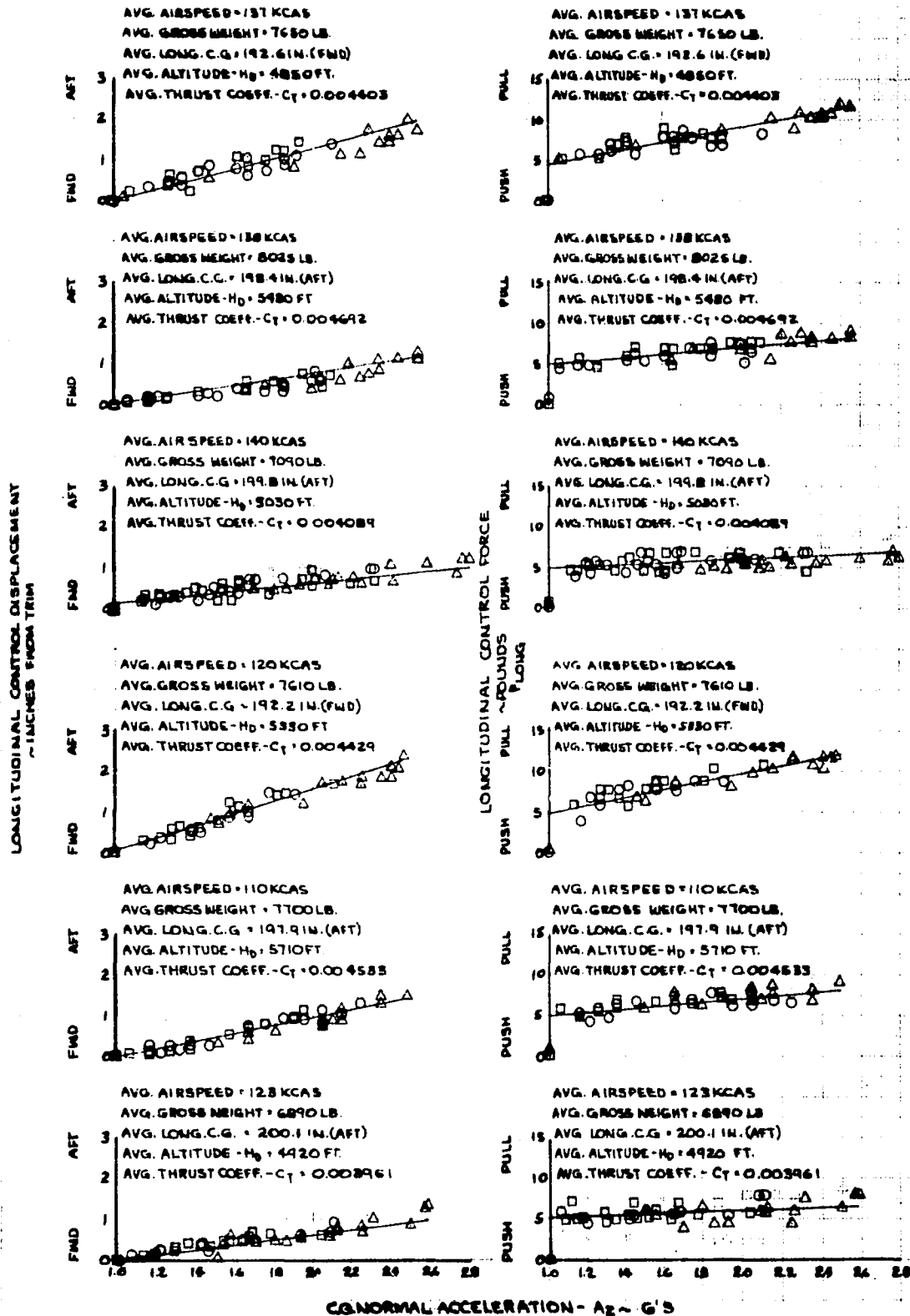


FIGURE No. 292
LATERAL CYCLIC CONTROL VARIATION WITH AIRCRAFT LOAD FACTOR

AH-1G USA 6618247
CLEAN CONFIGURATION
ROTOR SPEED - 824 RPM

NOTES:
○ DENOTES LEFT WING UP TURN
□ DENOTES RIGHT WING UP TURN
△ DENOTES SYMMETRICAL PULL-UP

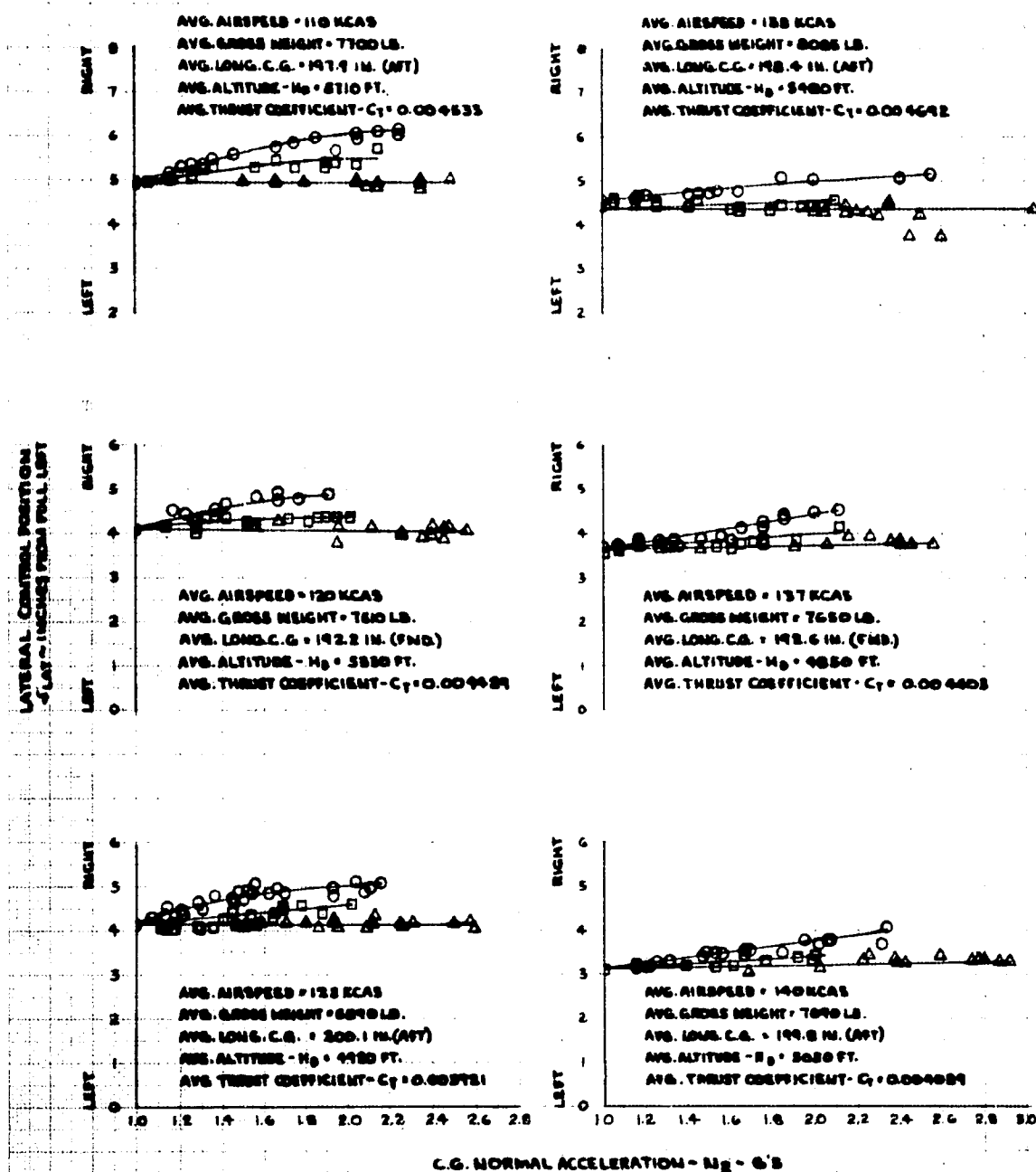


Figure No 293
SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA 46613 247
 CLEAN CONFIGURATION

AVG. TRIM CONDITIONS:

SYM.	DENSITY ALT. H ₀ ~ FT.	GRWT ~ LB.	LONG CG ~ IN.	ROTOR SPEED ~ RPM	CONFIGURATION OF LANDING GEAR CROSS TUBE FAIRINGS
○	5000	7250	201.0 (AFT)	324.0	INSTALLED
□	5000	7050	201.0 (AFT)	324.0	NOT INSTALLED

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS
 2. AVG. ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FT.

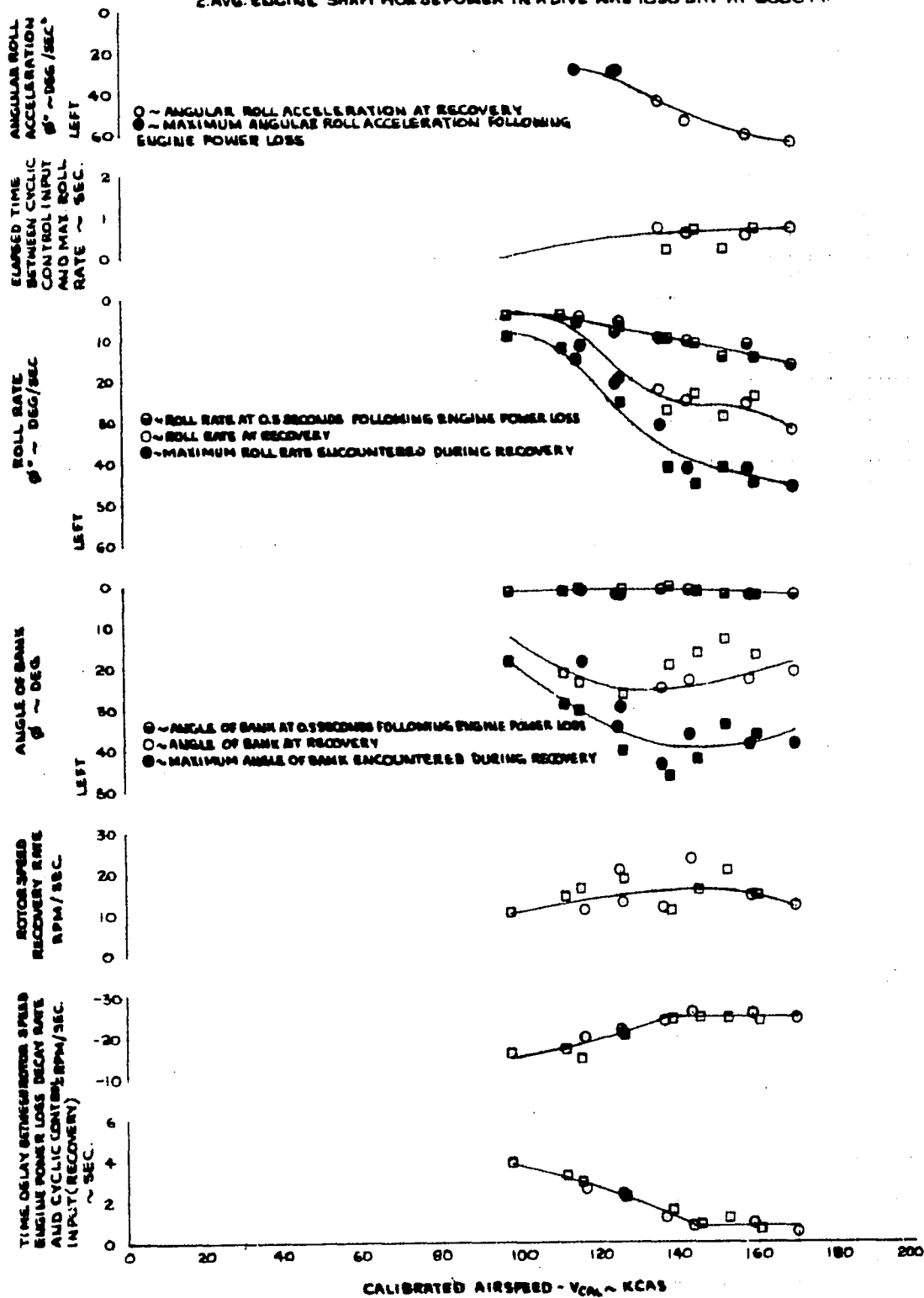


FIGURE No 295 (CONTINUED)

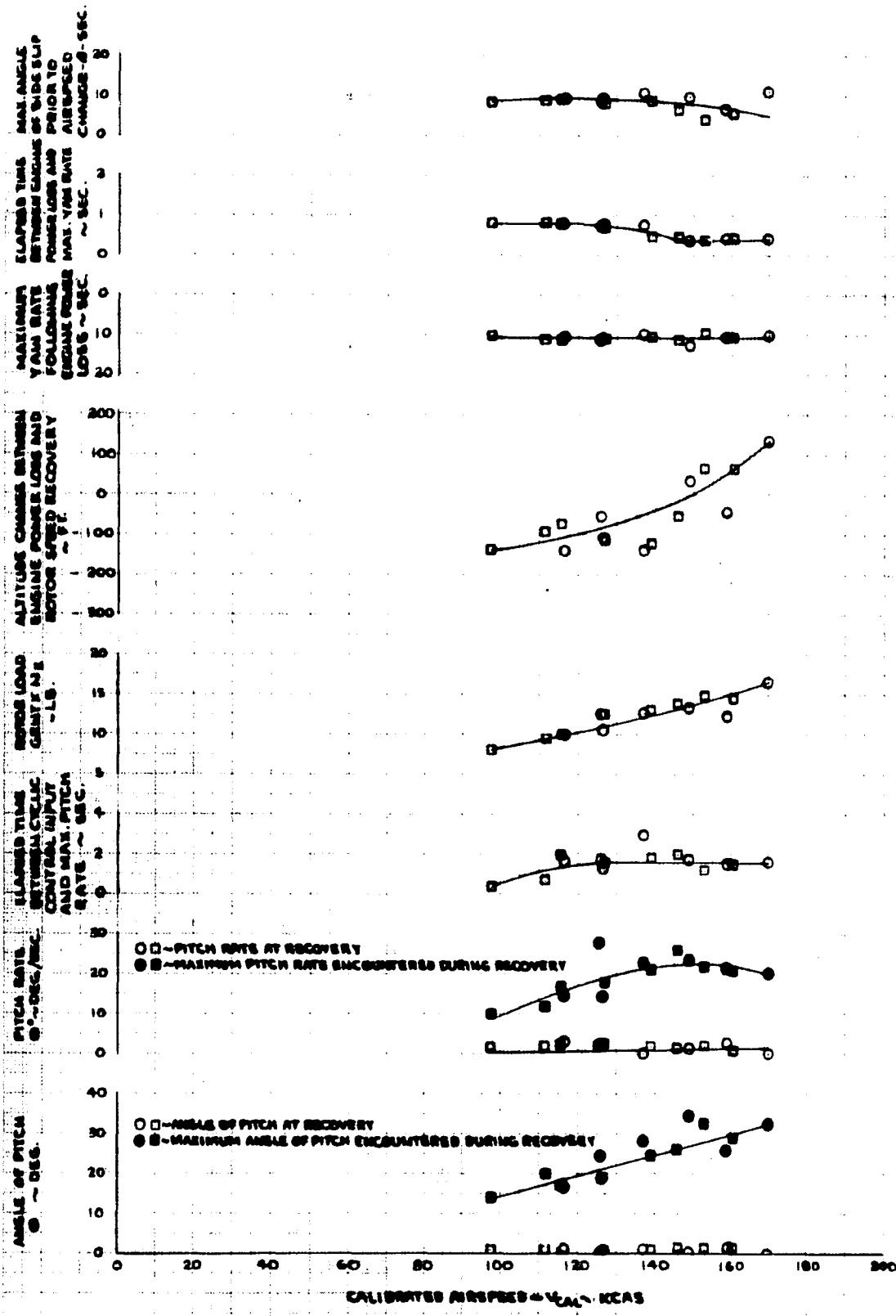


FIGURE No. 294
SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AM-10

USA 14615247

CLEAN CONFIGURATION

AVG TEST CONDITIONS:

SYM	DENSITY ALT	GEWT	LONG. CG	ENGINE SPEED
	H_0 ~ FT.	~ LB.	~ IN.	~ RPM
○	5000	8500	191.4 (FW)	3340
□	10000	8050	191.1 (FW)	3340

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS

2. AVG ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FT. AND 900 SHP AT 10000 FT.

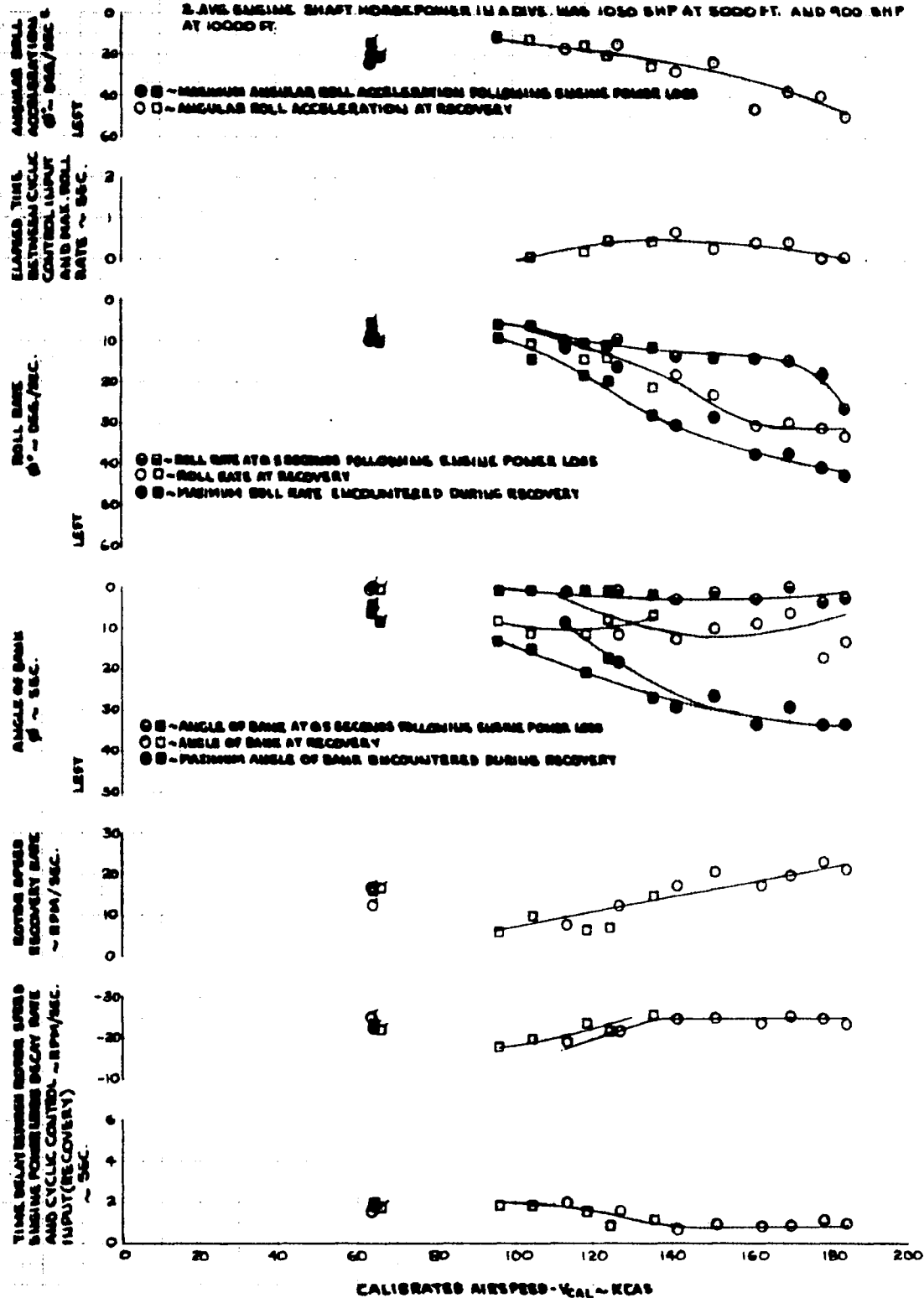


FIGURE No. 294 (CONTINUE)

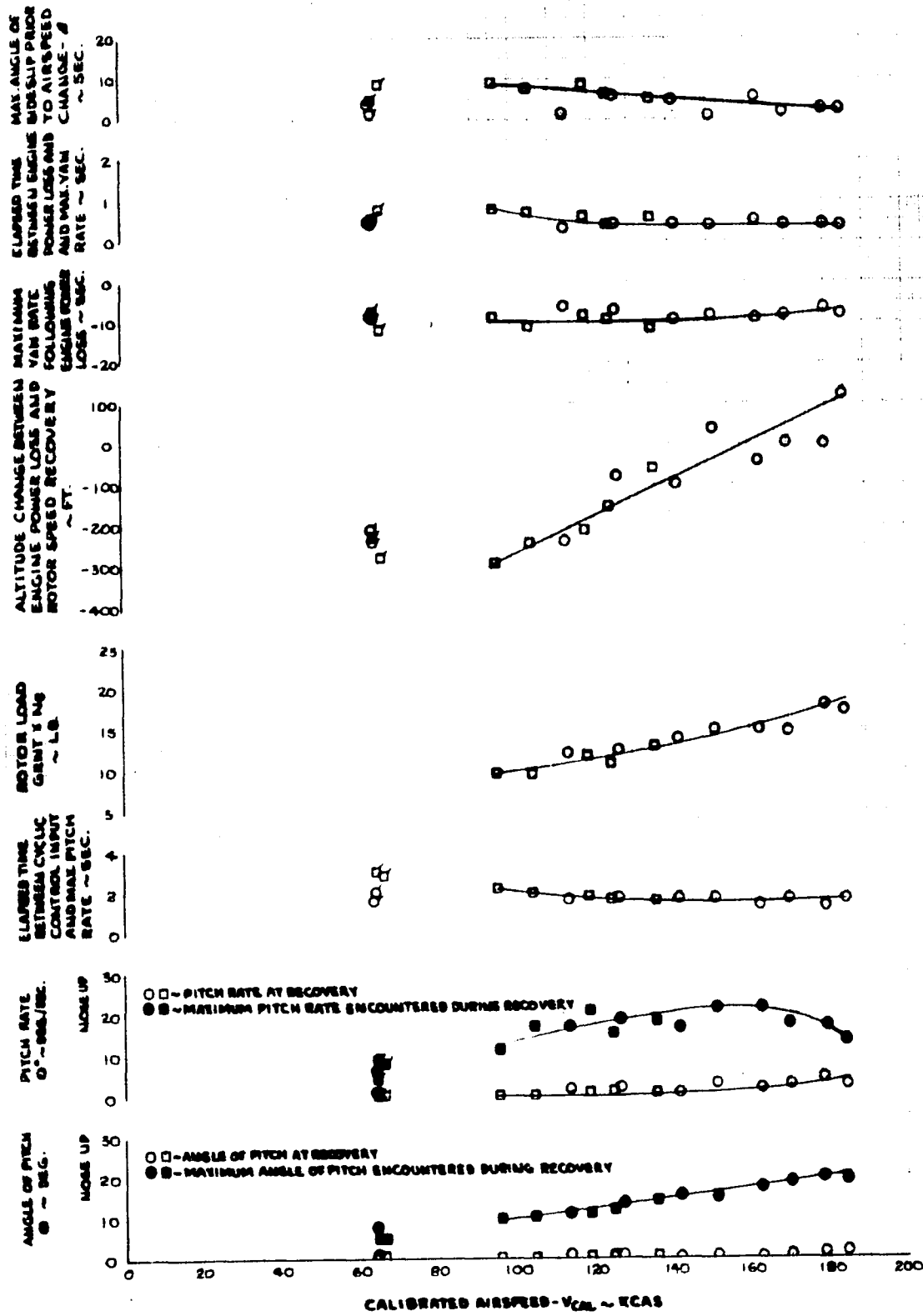


FIGURE No. 295
SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AM-1C

USA 4613247

CLEAN CONFIGURATION

AVG. TEST CONDITIONS:

SYM.	DENSITY ALT.	GEWT	LONG. C.G.	ROTOR SPEEDS
	H_0 - FT.	- LB	- IN.	- RPM
○	5000	5300	147.5 (AFT)	284.0
□	10000	5100	147.1 (AFT)	286.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS

2. AVG. ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FEET AND 100 SHP AT 10000 FEET

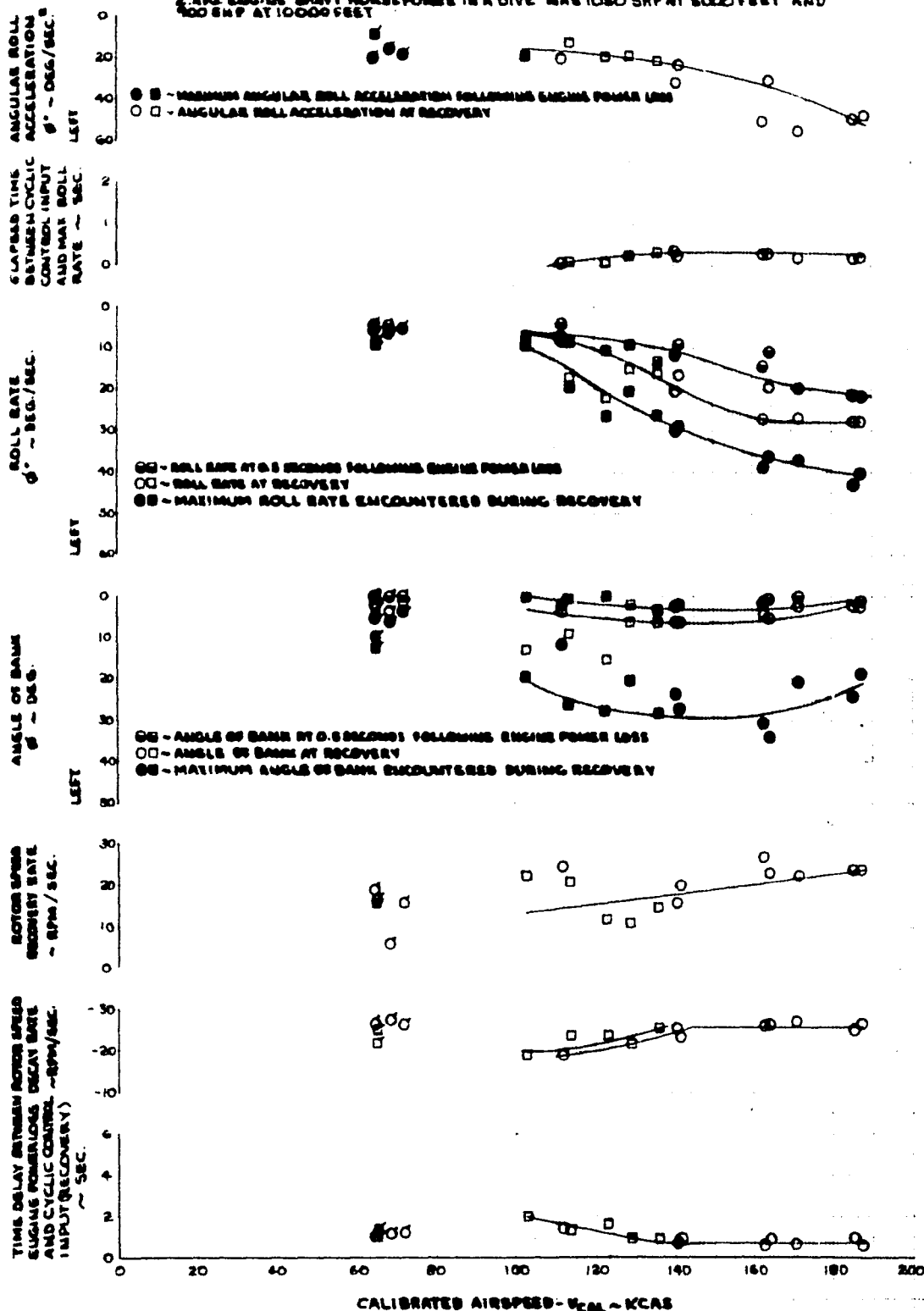


FIGURE NO 295 (CONTINUED)

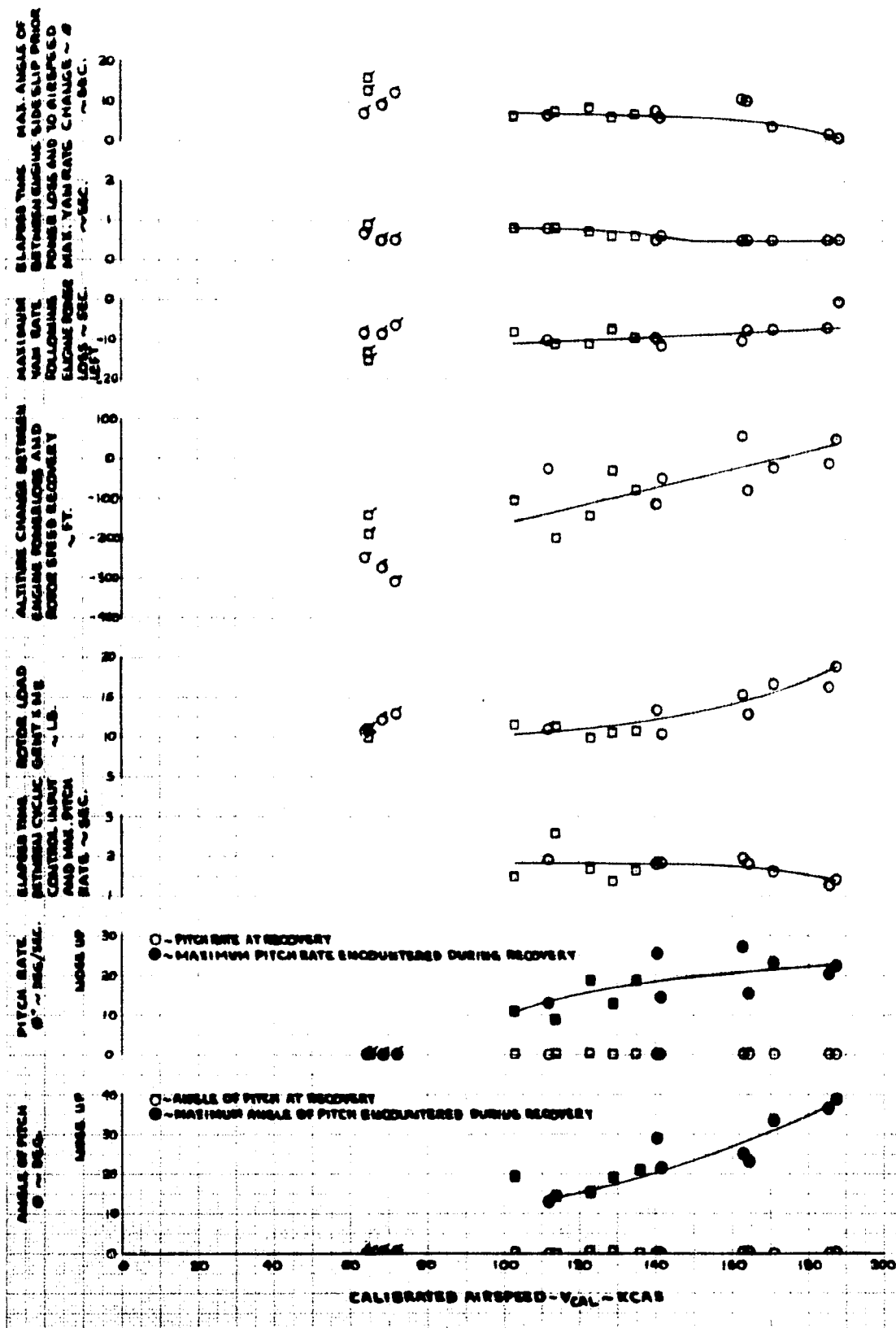


FIGURE NO. 296
SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE
 AH-1G USA 9615247
 HVT. HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AVG. TRIM CONDITIONS:
 SYM. DENSITY ALT. GRWT LONG. CG. ROTOR SPEED
 HO ~ FT. ~ LB. ~ IN. ~ RPM
 O 5000 9350 142.8 (FMR) 324.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS
 2. AVG. ENGINE SHAFT HORSEPOWER IN ABOVE WAS 1050 SHP AT 5000 FEET

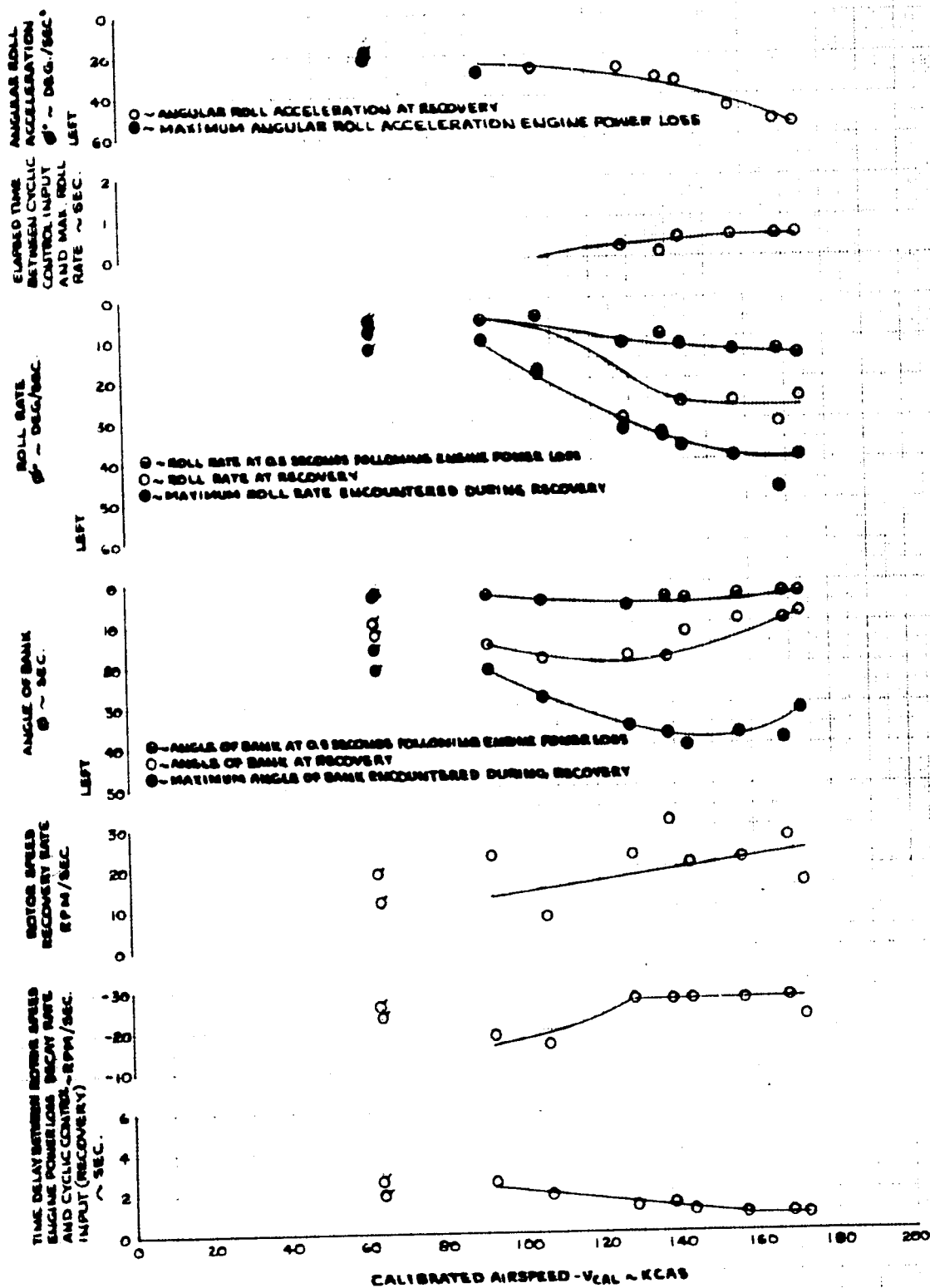


FIGURE No. 296 (CONTINUED)

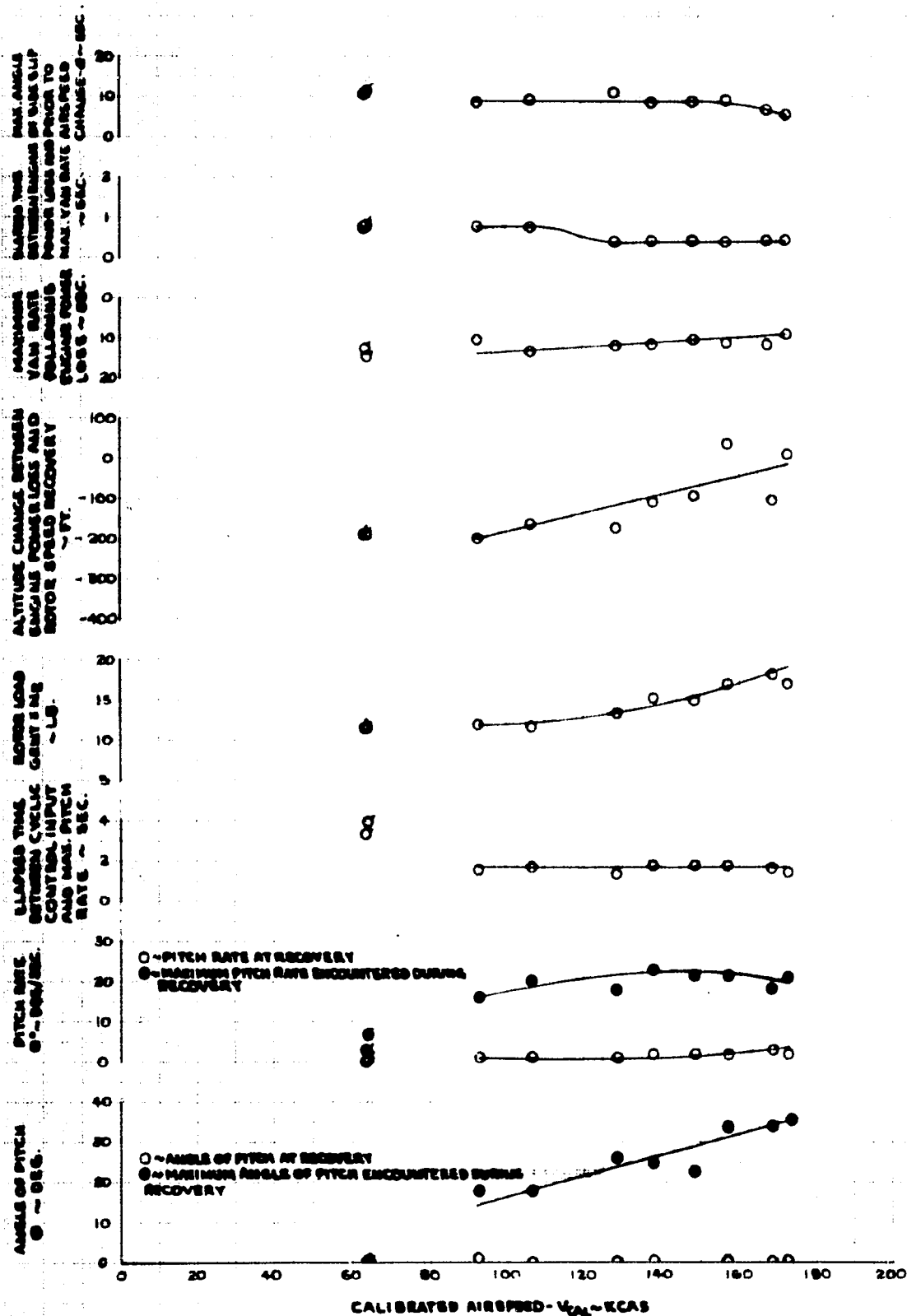


FIGURE No 297
SUMMARY OF AIRCRAFT REACTION AND RECOVERY FOLLOWING A SIMULATED ENGINE FAILURE

AH-1G USA 4613247
 HVY. HOG CONFIGURATION WITH ROCKET POOD FAIRINGS REMOVED
 AVG. TRIM CONDITIONS:
 SYM. DENSITY ALT. GENT LONG. C.G. ROTOR SPEED
 H₀ ~ FT. ~ LB. ~ IN. ~ RPM
 ○ 5000 9500 200 (AFT) 324.0

NOTES: 1. FLAGGED SYMBOLS DENOTE CLIMBING FLIGHT AT 1100 SHP OR ENGINE TOPPING POWER WHICHEVER IS LESS
 2. AVG ENGINE SHAFT HORSEPOWER IN A DIVE WAS 1050 SHP AT 5000 FT

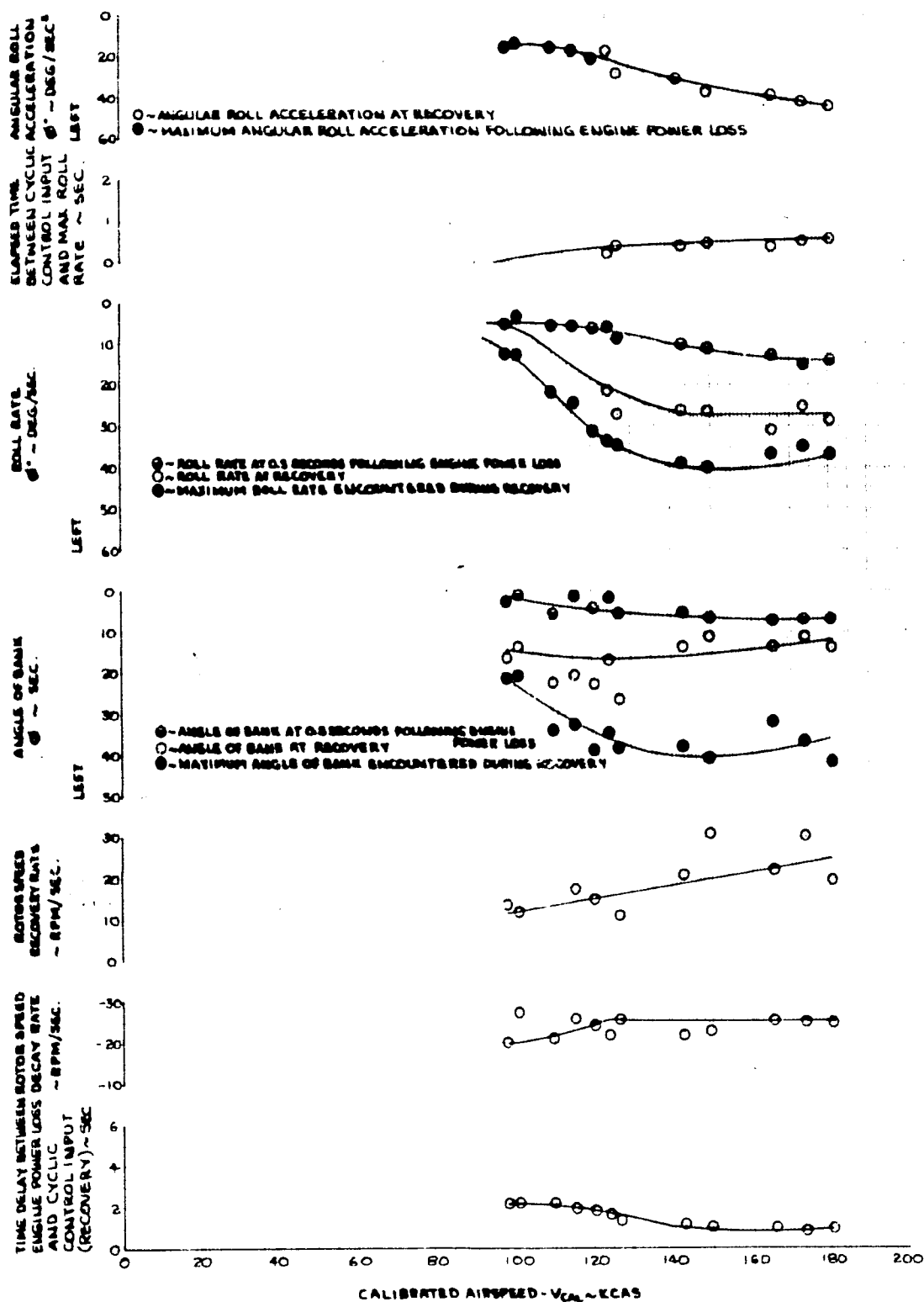


FIGURE NO. 297 (CONTINUED)

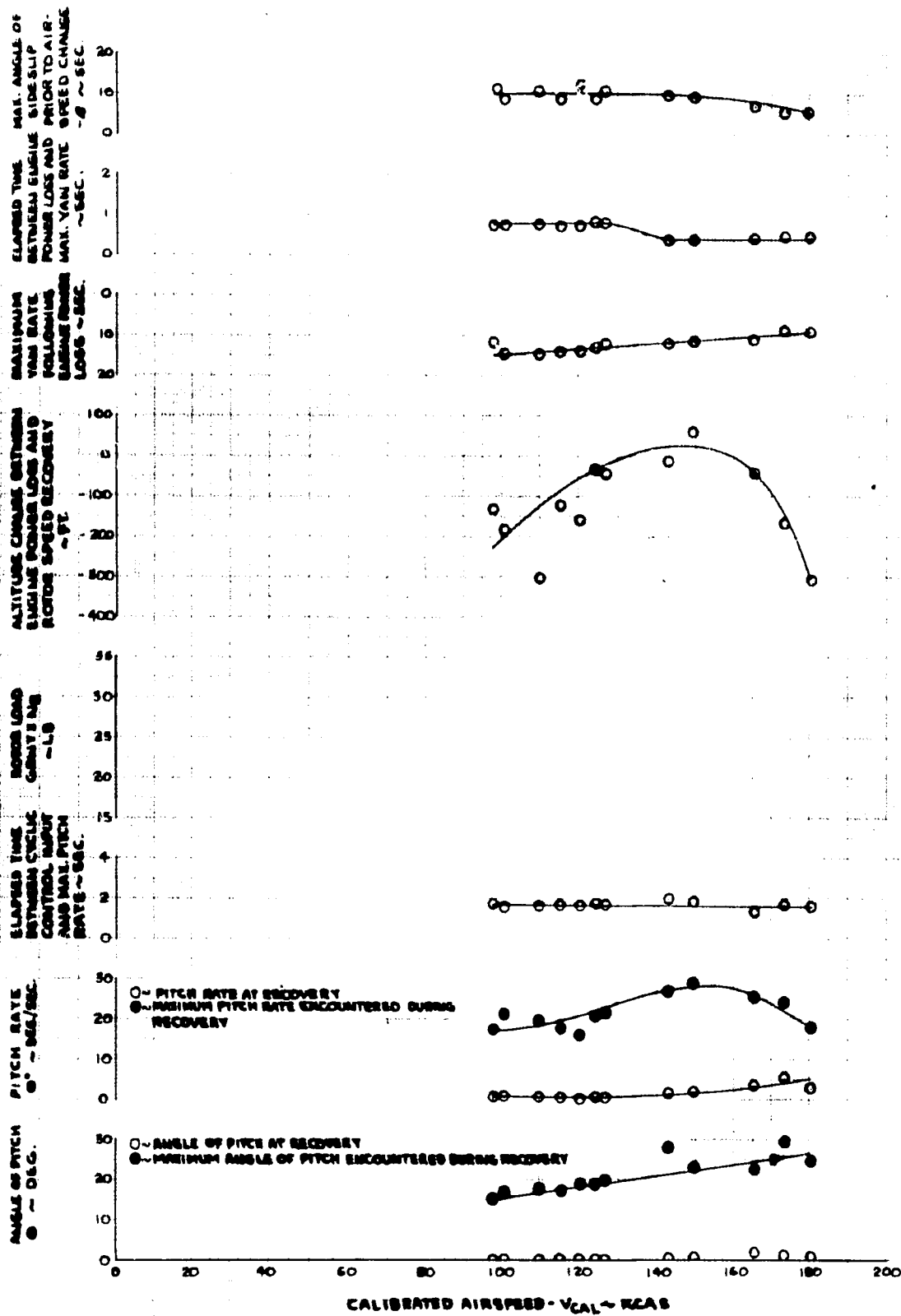


FIGURE NO. 298 AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-1G USA 6615247

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIRSPEED
149~KCAS

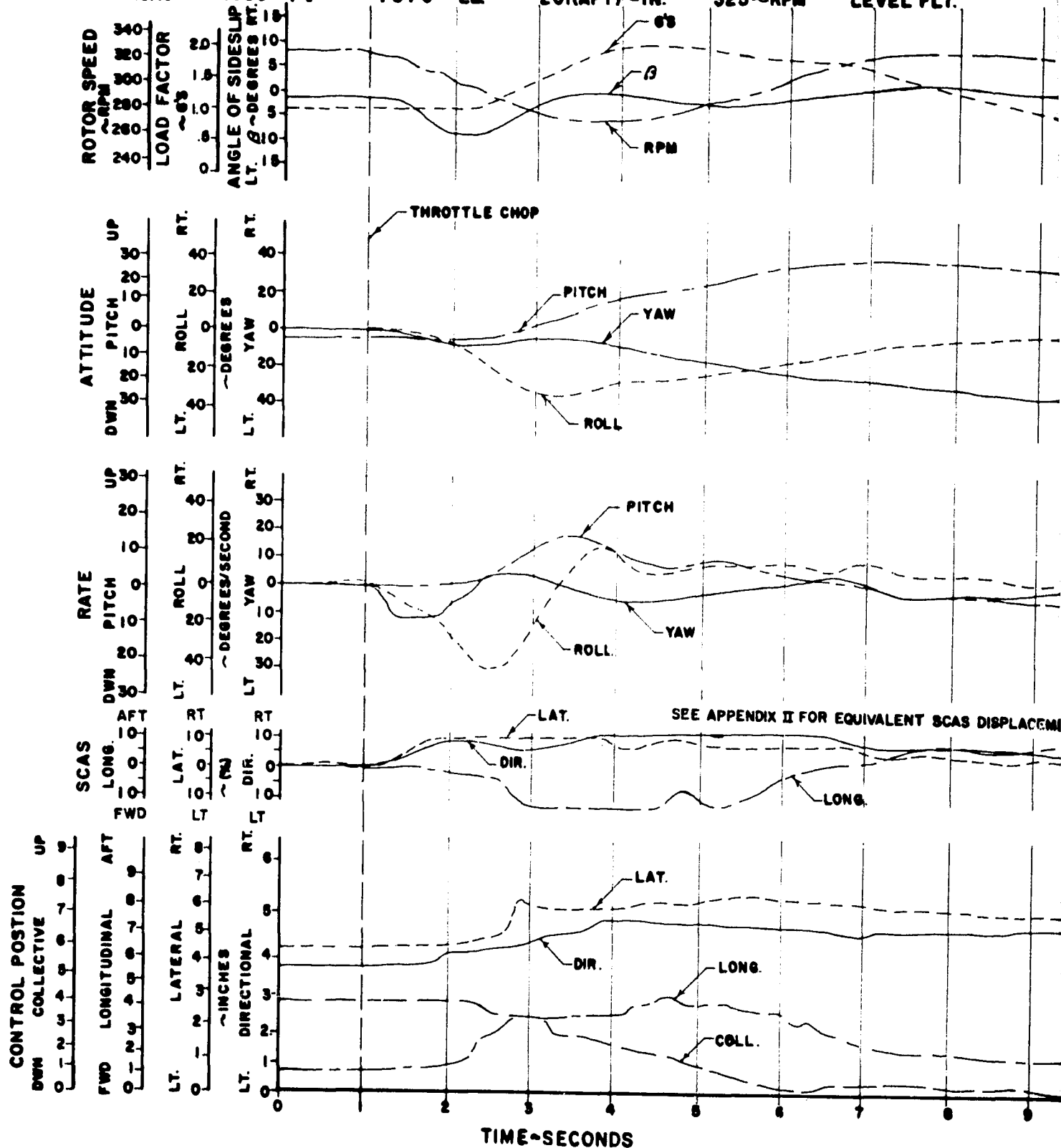
ALTITUDE(Hg)
4790~FT

GROSS WEIGHT
7070~LB

LONG.C.G.
201(AFT)~IN.

ROTOR SPEED
325~RPM

FLT.CONDITION
LEVEL FLT.



ENGINE FAILURE

FAIRINGS REMOVED

ROTOR SPEED 325 ~ RPM

FLT. CONDITION

LEVEL FLT.

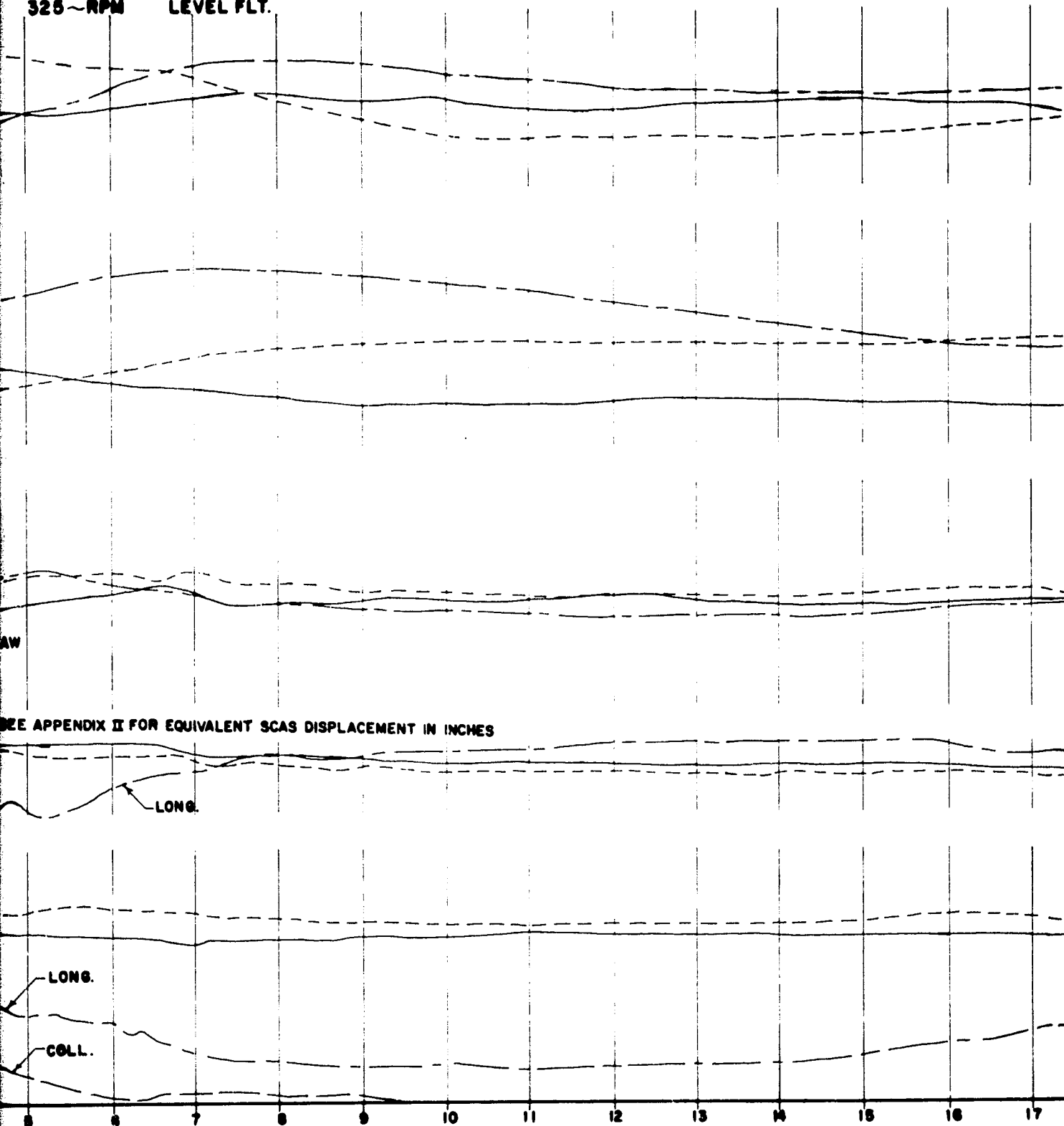
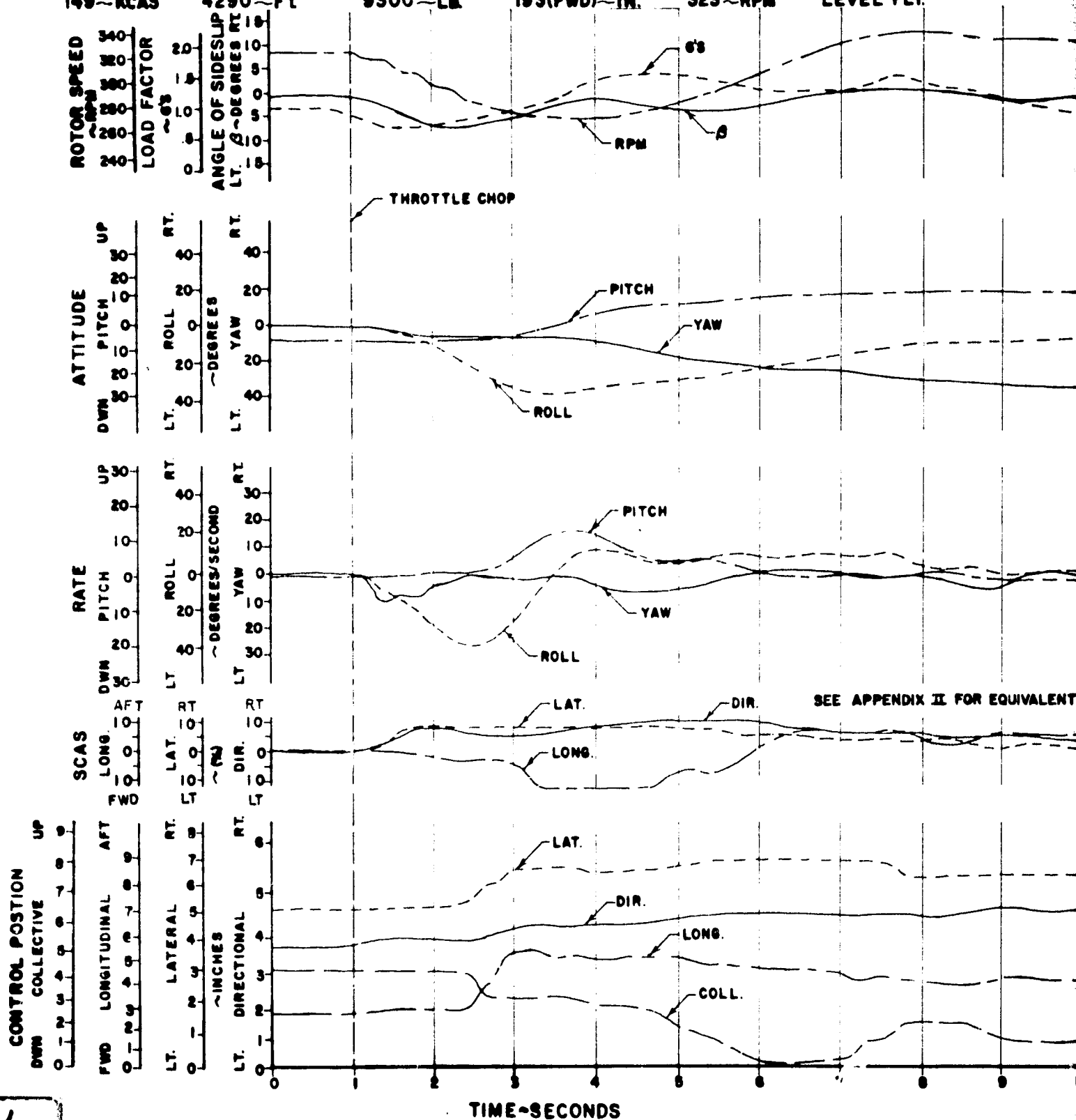


FIGURE NO. 299 AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-1G USA 76615247

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 149~KCAS ALTITUDE(Hb) 4290~FT GROSS WEIGHT 9300~LB LONG.C.G. 193(FWD)~IN. ROTOR SPEED 323~RPM FLT.CONDITION LEVEL FLT.



ENGINE FAILURE

RINGS REMOVED

MOTOR SPEED 323~RPM FLI. CONDITION
LEVEL FLT.

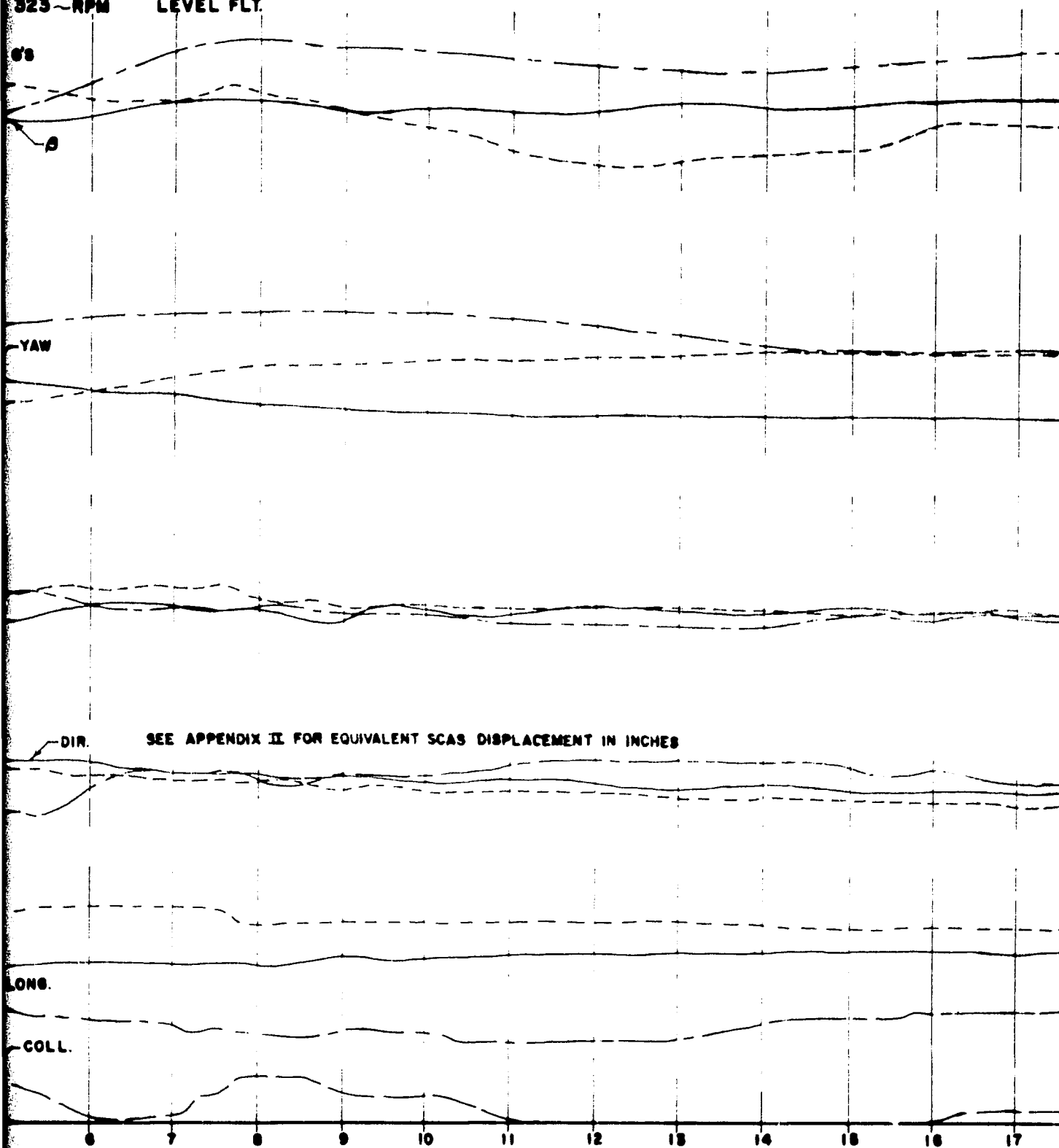
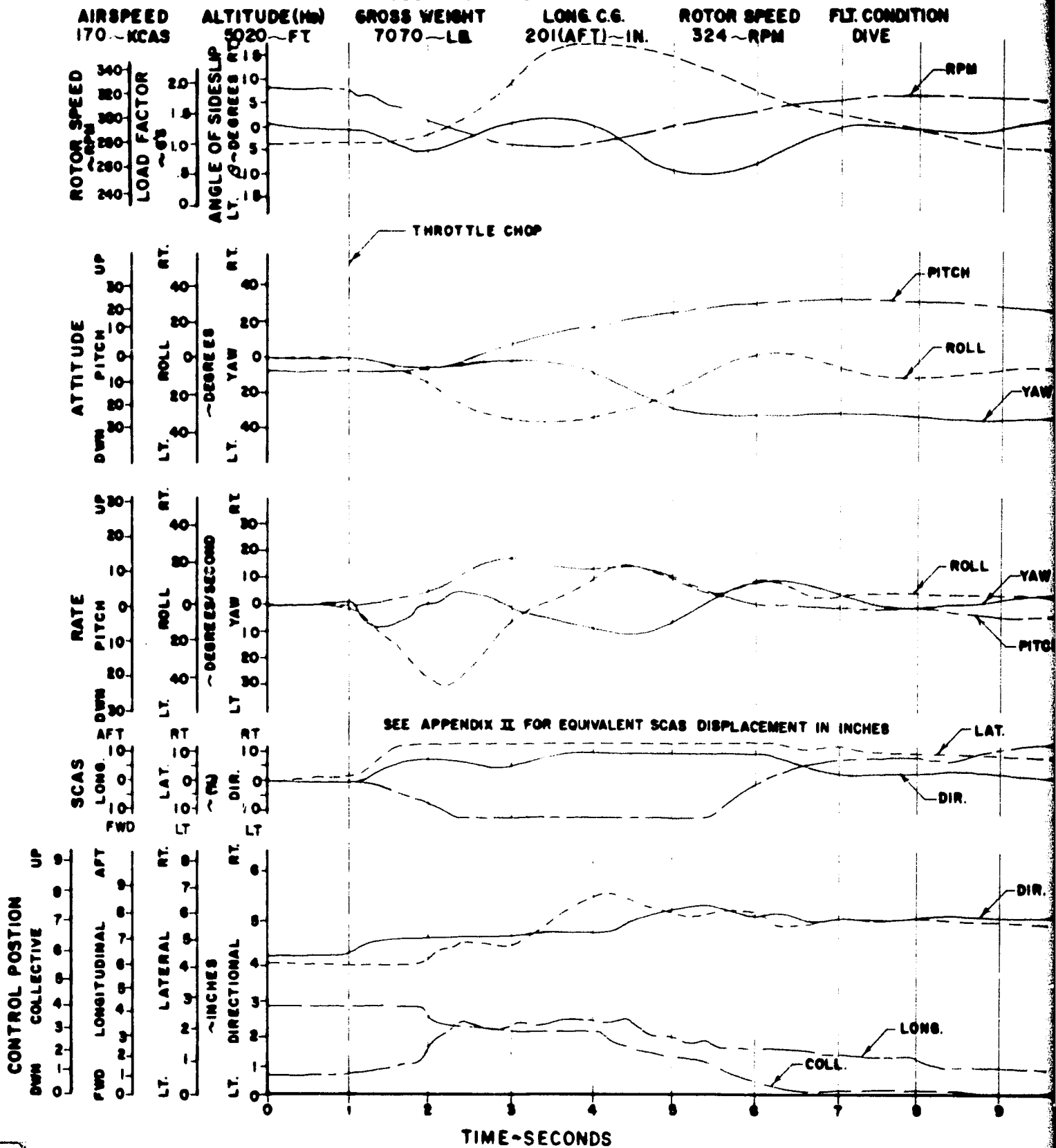


FIGURE NO. 300 AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-1G USA 746615247
CLEAN CONFIGURATION



ENGINE FAILURE

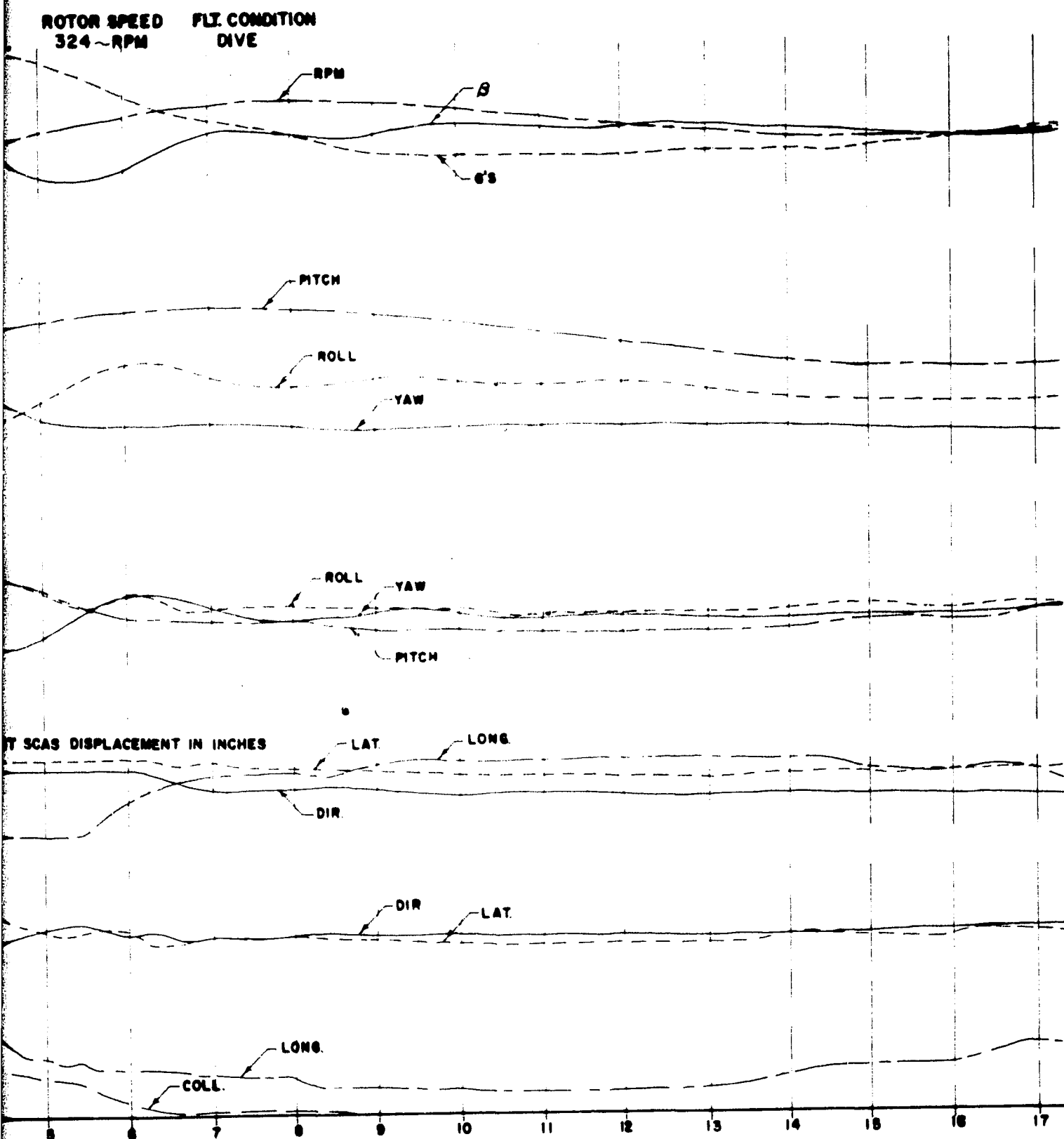
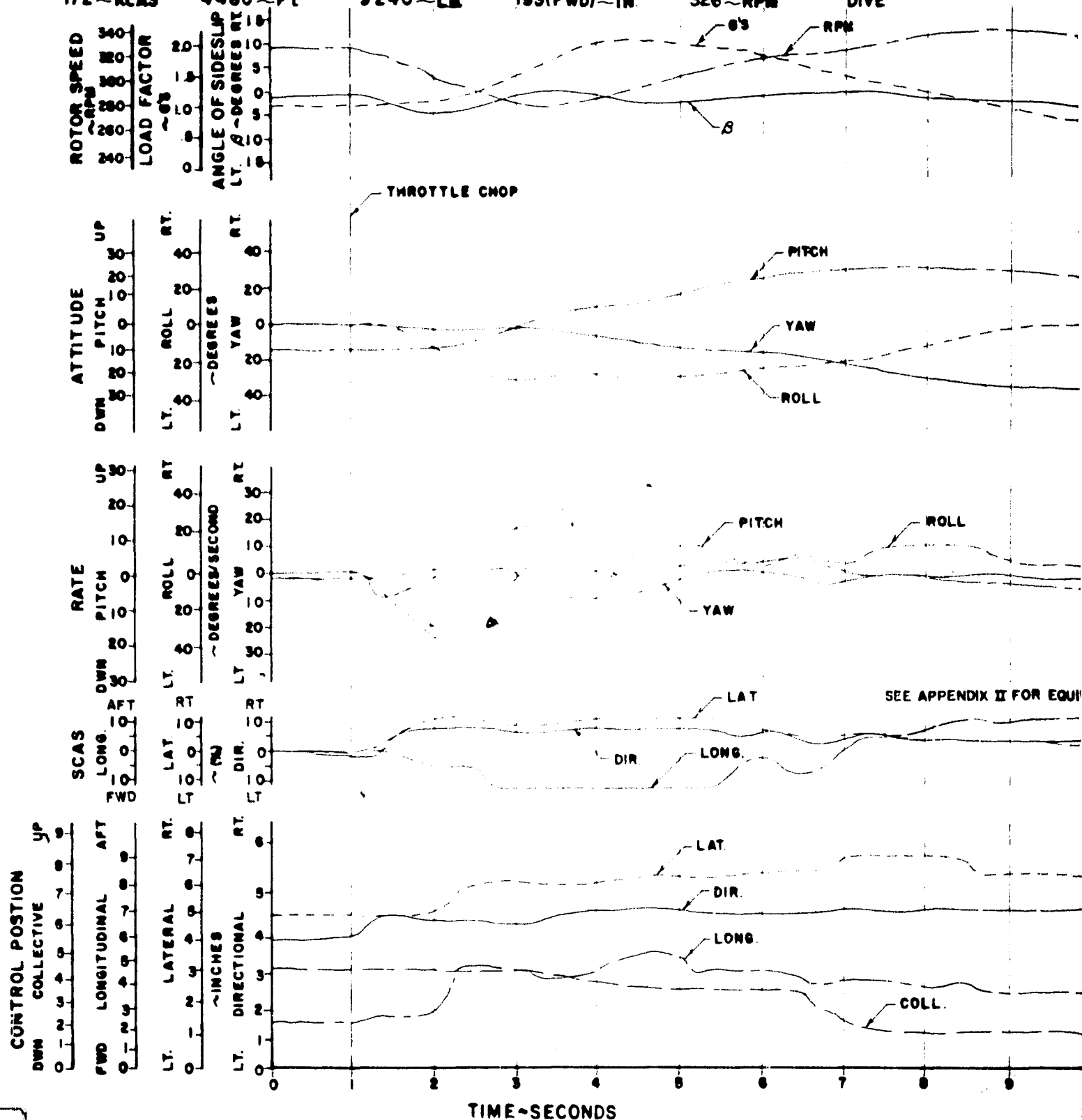


FIGURE NO. 301 AIRCRAFT REACTION TO SIMULATED ENGINE FAILURE

AH-1G USA 76615247

HEAVY HOG CONFIGURATION WITH ROCKET POD FAIRINGS REMOVED

AIR SPEED 172 ~ KCAS ALTITUDE (Hb) 4480 ~ FT GROSS WEIGHT 9240 ~ LB LONG. C.G. 193 (FWD) ~ IN. ROTOR SPEED 326 ~ RPM FLT. CONDITION DIVE

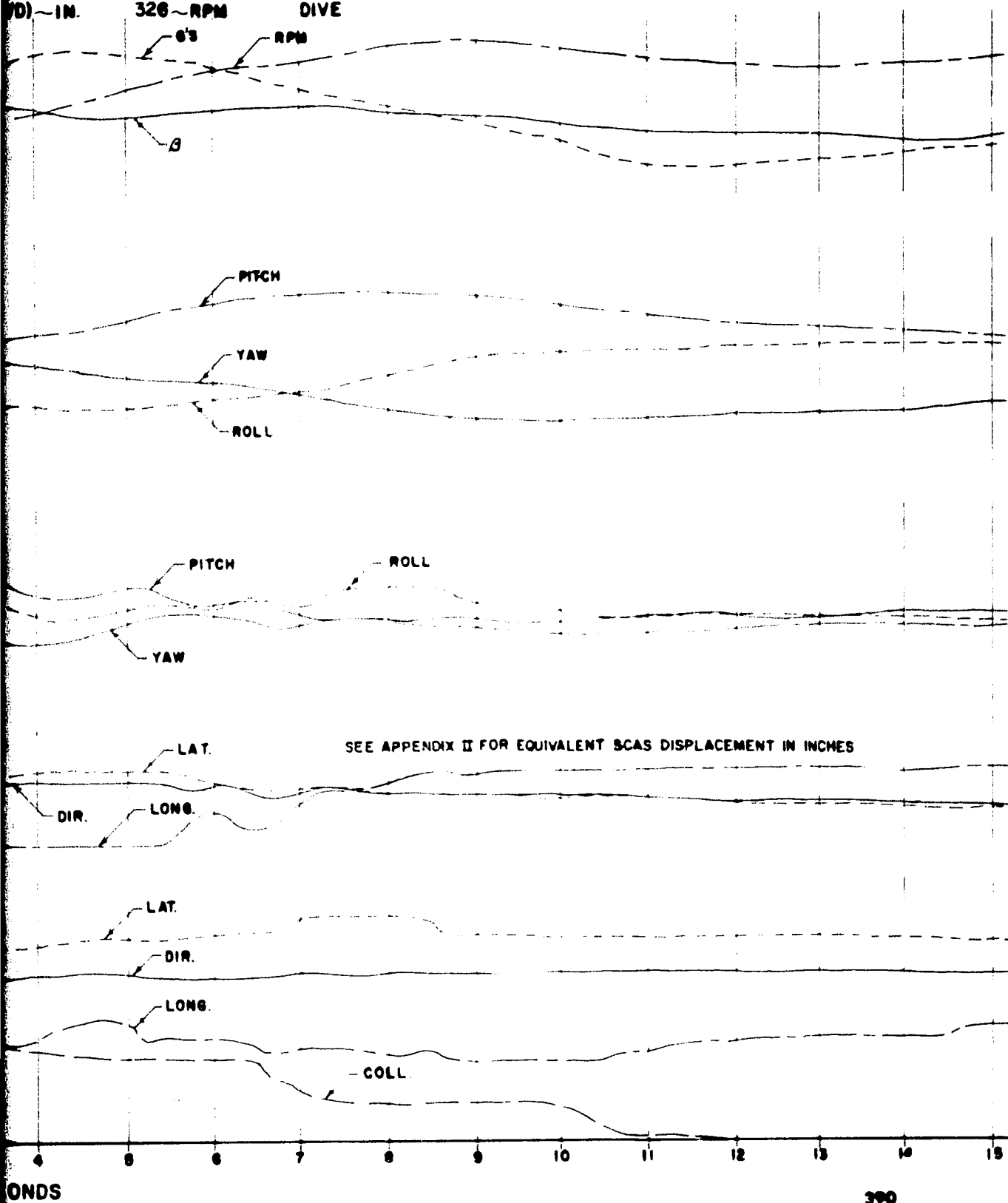


0. 301
 LATED ENGINE FAILURE

247

WET POD FAIRINGS REMOVED

C.G. ROTOR SPEED FLT. CONDITION
 (D) ~ IN. 320 ~ RPM DIVE



2

FIGURE No. 802
AIR SPEED CALIBRATION
AH-1G Y53-L-15
STANDARD AIRSPEED SYSTEM

SYM	AIRCRAFT S/N	CONFIGURATION	GRWT ~LB	DENSITY ALT. ~FT.	ROTOR SPEED ~RPM	LONG.CG. ~IN.	SOURCE OF DATA
○	615247	CLEAN	7810	5500	324	191.7 (FWD)	PHASE D TEST PROG.
□	615246	BASIC	8280	5860	324	193.3 (FWD)	REF. 2 APP. I
△	615248	BASIC	8170	4920	324	194.2 (MID)	REF. 4 APP. I
◇	615283	OUTED ALTERNATE	8290	3100	324	199.1 (AFT)	REF. 5 APP. I

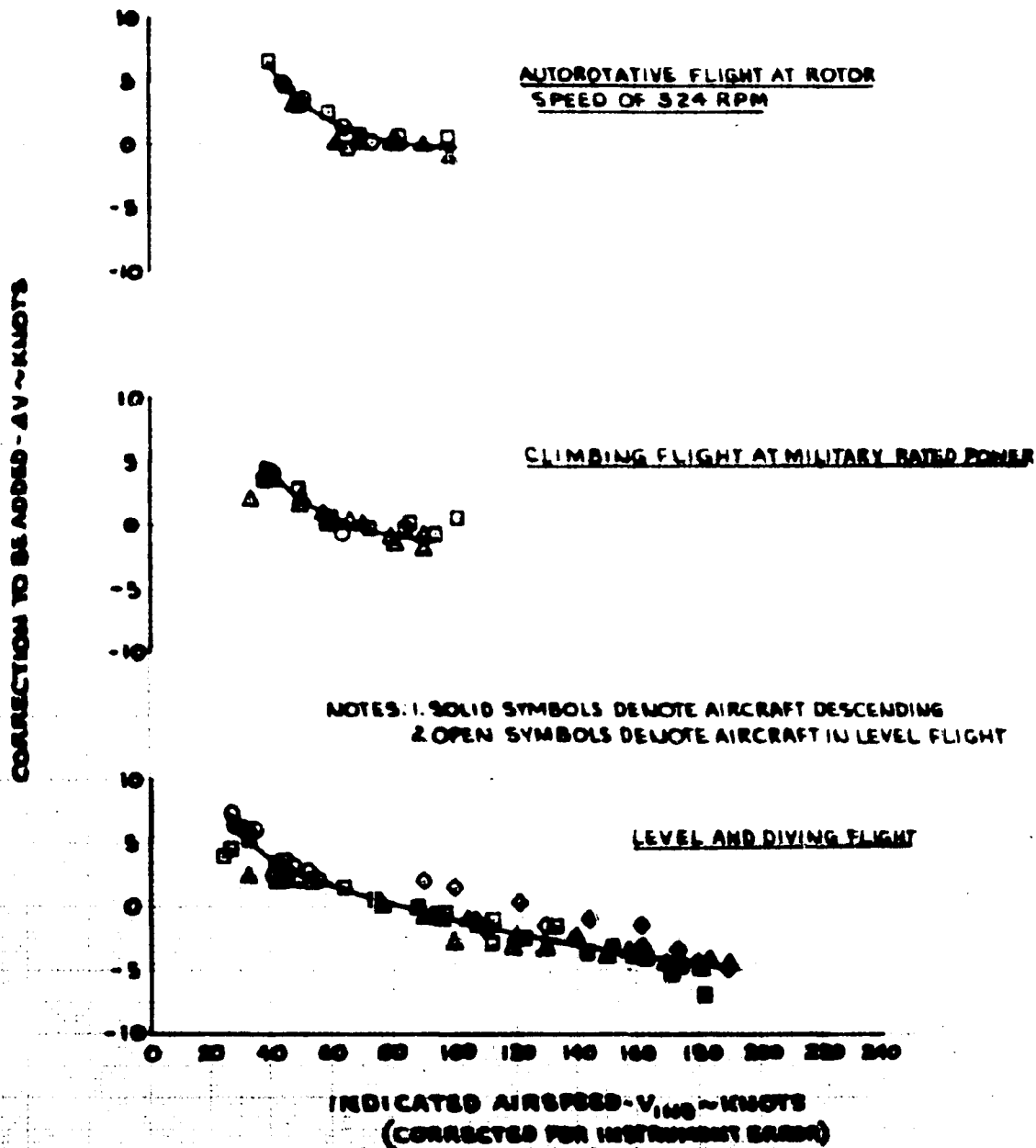


FIGURE No 303
AIRSPEED CALIBRATION
AH-1G USAF NG15247
BOOM SYSTEM

SYM.	GROSS WEIGHT ~LBS.	CG STATION ~IN.	DENSITY ALTITUDE ~FT.	ROTOR SPEED ~RPM	CONFIGURATION
□	7265	1935	1020 FT	324	CLEAN
○	7176	1933	5300 FT	324	CLEAN
△	7200	1933	6000 FT	324	CLEAN

NOTES: 1. □ DATA COLLECTED USING THE GROUND SPEED METHOD.
 2. ○ DATA COLLECTED USING THE PACER AIRCRAFT METHOD.
 3. △ DATA COLLECTED USING THE TRAILING BOMB METHOD.
 4. SHADED SYMBOLS DENOTE CLIMB AT LIMIT POWER
 5. FLAGGED SYMBOLS DENOTE AUTOROTATION

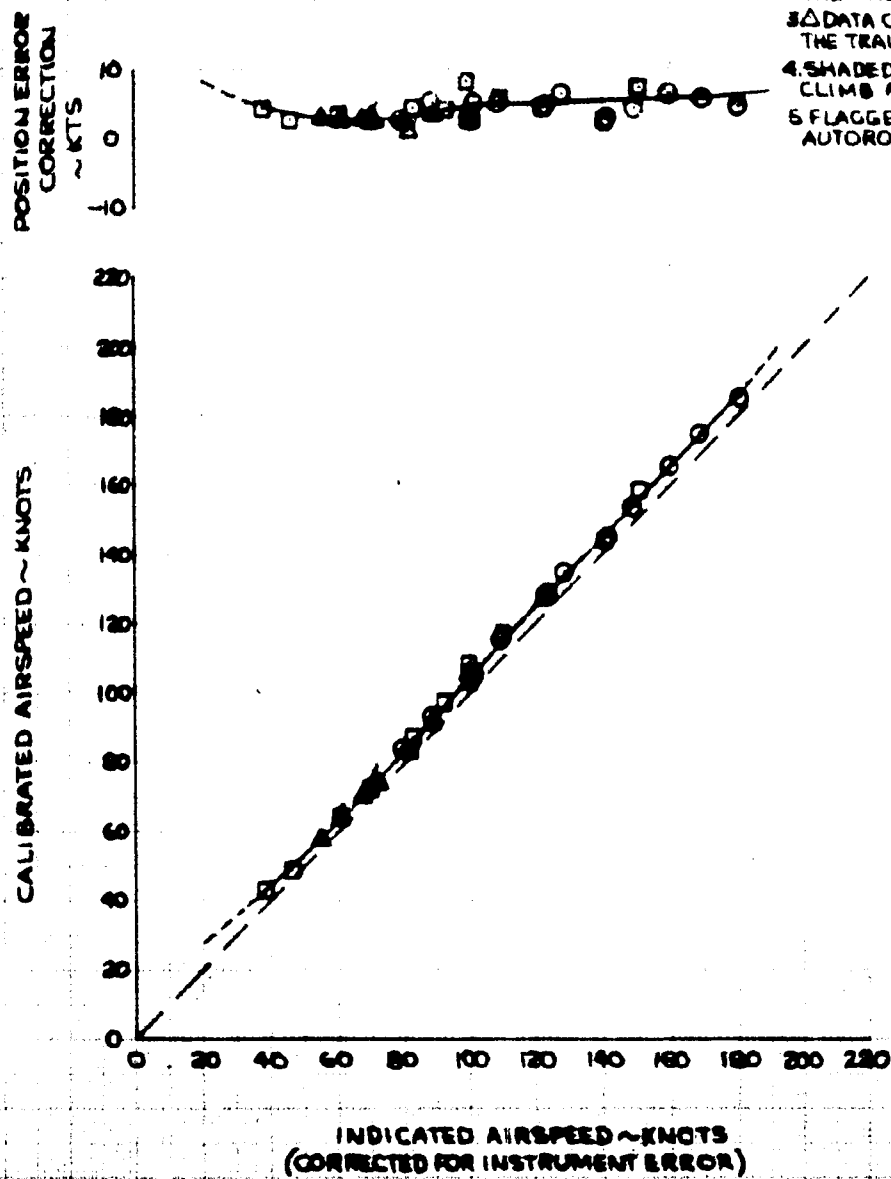
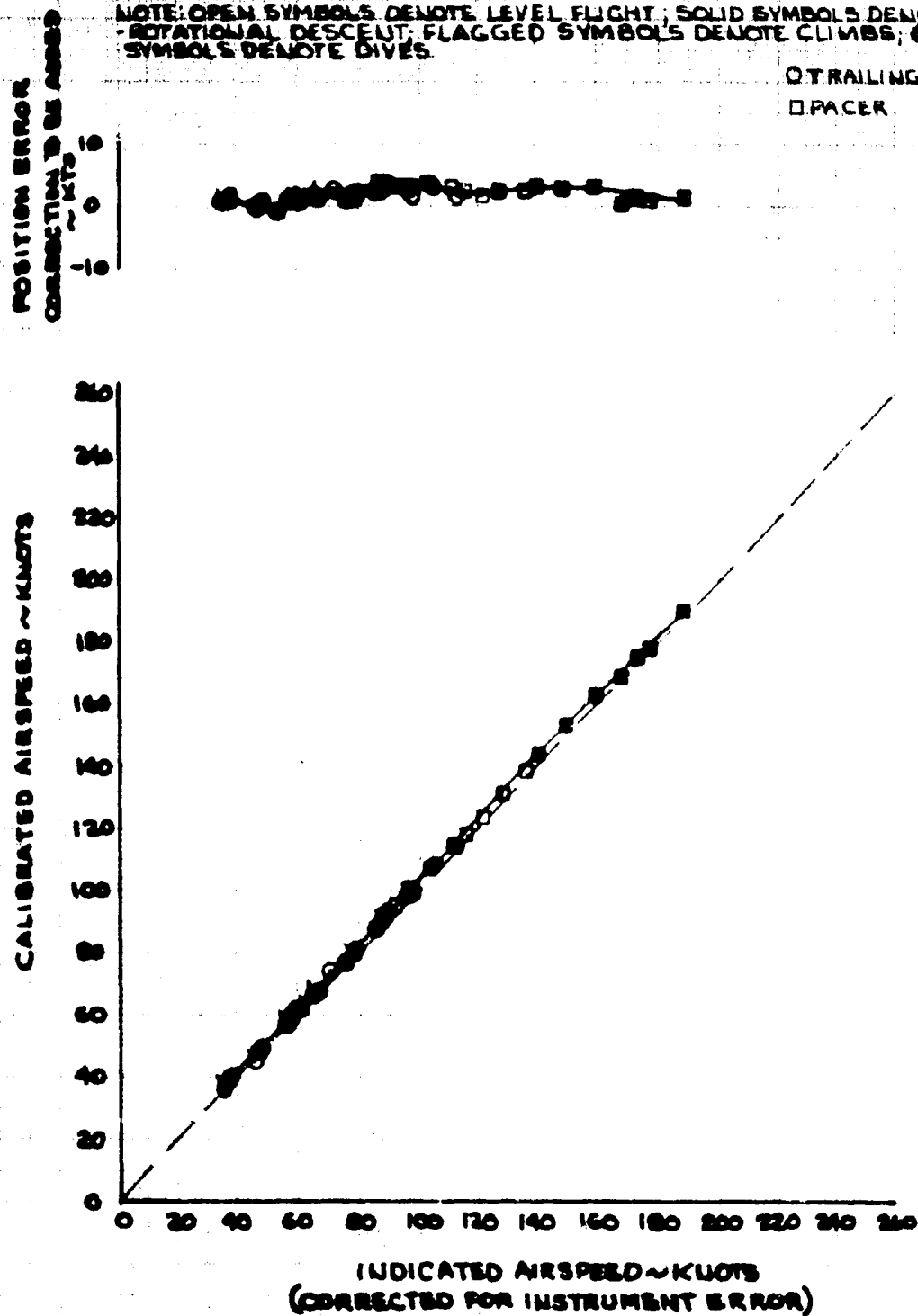


FIGURE No. 304
AIRSPEED CALIBRATION
AH-1G USA SN 718075

SYM.	GROSS WEIGHT	CG STATION	DENSITY ALTITUDE	ROTOR SPEED	CONFIGURATION
○	~ 1250	~ 1915	~ 4650	~ 3240	CLEAN
□	~ 1250	~ 1915	~ 7250	~ 3240	CLEAN

NOTE: OPEN SYMBOLS DENOTE LEVEL FLIGHT; SOLID SYMBOLS DENOTE AUTO-ROTATIONAL DESCENT; FLAGGED SYMBOLS DENOTE CLIMBS; & CROSS SYMBOLS DENOTE DIVES.

○ TRAILING BOMB
 □ PACER



APPENDIX VIII. TEST CONDITIONS

Table 1. Static Trim Stability.

Rotor speed = 324 rpm				
Configuration	Flight Condition	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)
Clean ¹	Level Flight and Dive	8665	3080	199.8 (aft)
Clean	Level Flight and Dive	8450	4540	200.8 (aft)
		8470	4980	191.4 (fwd)
		8420	14100	200.9 (aft)
	Climb	8170	5470	201.1 (aft)
		8240	5000	191.2 (fwd)
	Auto-rotation	8170	4950	201.1 (aft)
		8290	5000	191.2 (fwd)
Outboard Alternate ²	Level Flight and Dive	8500	3720	200.8 (aft)
		9430	6480	200.0 (aft)
		8410	13800	200.9 (aft)
Heavy scout ²	Level Flight and Dive	8370	4040	201.0 (aft)
		9555	3500	200.0 (aft)
Heavy hog ²	Level Flight and Dive	8530	5360	200.8 (aft)
		9580	4440	200.0 (aft)
		8620	4960	191.8 (fwd)
		8600	14760	200.7 (aft)
	Climb	9320	5470	200.2 (aft)
		8280	6000	201.0 (aft)
		8350	5650	191.2 (fwd)
	Auto-rotation	9290	4950	200.1 (aft)
		8310	5920	201.0 (aft)
		8340	5770	191.5 (fwd)

¹Landing gear cross-tube fairings removed.

²Rocket pod fairings removed

Table 2. Static Longitudinal Collective Fixed Stability.

Rotor speed = 324 rpm				
Configuration	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean ¹	8490	4630	199.7 (aft)	$0.8V_H, V_H, V_L$
Clean	8460	5310	200.8 (aft)	V for min R/D
Clean	8100	6750	191.0 (fwd)	V for R/C
Heavy hog ²	8100	5730	201.1 (aft)	V for min pwr rq'd
Heavy hog ²	8220	5940	191.1 (fwd)	$0.8V_H, V_H$ and V_L
Outboard Alternate ²	8190	4970	201.0 (aft)	V for min pwr rq'd
Heavy scout ²	8015	5320	201.0 (aft)	$0.8V_H, V_H$, and V_L
Outboard Alternate ²	9010	5730	200.4 (aft)	
Heavy scout ²	9240	5320	200.2 (aft)	
Heavy hog ²	9140	5310	200.3 (aft)	
Clean	8150	15420	201.1 (aft)	V for min pwr rq'd
Outboard Alternate ²	8180	14650	201.7 (aft)	V_H
Heavy hog ²	8570	14640	200.7 (aft)	V_L

¹Landing gear cross-tube fairings removed.

²Rocket pod fairings removed.

Table 3. Static Lateral-Directional Stability.

Rotor speed = 324 rpm				
Configuration	Gross Weight (lb)	Density Altitude (ft)	Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean ¹	8770	3700	200.6 (aft)	$0.8V_H, V_H, V_L$
Clean	8290	5400	199.2 (aft)	V for min R/L
Outboard Alternate ²	8680	6080	200.7 (aft)	V for min R/D
Heavy scout ²	8330	6750	201.0 (aft)	V for min pwr rq'd
Heavy hog ²	8310	6080	200.9 (aft)	$0.8V_H$
Heavy hog ²	8080	6070	191.1 (fwd)	V_H and V_L
Heavy hog ²	9465	5170	200.0 (aft)	
Heavy hog ²	7745	4730	201.3 (aft)	
Heavy hog ²	8510	14640	200.8 (aft)	V for min pwr rq'd V_H and V_L

¹Landing gear cross-tube fairings removed.

²Rocket pod fairings removed.

Table 4. Longitudinal Dynamic Stability.

Control Inputs Forward and Aft					
Rotor speed = 324 rpm					
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Stability and Control Augmentation System	Trim Airspeeds
Clean	7660	5000	190.5 (fwd)	ON and OFF	V for min pwr req'd
Clean	7540	4000	201 (aft)	ON and OFF	V for max R/C V for min R/D 0.8V _H , V _H and V _L
Heavy hog ¹	7740	4300	201 (aft)	ON and OFF	
Heavy hog ¹	9340	4400	200 (aft)	ON	V for min pwr req'd 0.8 V _H , V _H , V for max A/C
				OFF	V _H , V for max R/C
Heavy scout ¹	9310	4500	200 (aft)	ON	V for max R/C 0.8V _H , V _H , V _L
Heavy hog ¹	7730	15000	201 (aft)	ON and OFF	V for max R/L 0.8V _H , V _H

¹Rocket pod fairings removed.

Table 5. Lateral Dynamic Stability.

Inputs Right and Left					
Rotor speed = 324 rpm					
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Stability and Control Augmentation System	Trim Airspeeds
Clean	7300	4100	201 (aft)	ON and OFF	V for min pwr rq'd
Heavy hog ^{1,2}	8360	4500	195 (mid)	ON and OFF	V for max R/C V for min R/D 0.8V _H , V _H , V _L
Heavy hog ^{1,3}	8680	3600	195 (mid)	ON and OFF	
Heavy hog ^{1,2}	7620	3700	201 (aft)	ON and OFF	V for min pwr rq'd 0.8V _H , V _H , V _L
Heavy hog ^{1,2}	7690	15060	201 (aft)	ON OFF	V for min pwr rq'd 1.8V _H , V _L 0.8V _H , V _H
Heavy scout ^{1,3}	9000	5000	200 (aft)	ON	0.8V _H , V _H
Clean ⁴	8630	3700	199.5 (aft)	ON OFF	0.8V _H , V _H , V _L V _H , V _L

¹Rocket pod fairings removed.

²Rocket pods empty.

³Rocket pods loaded with rockets.

⁴Landing gear cross-tube fairings removed.

Table 6. Directional Dynamic Stability.

Control Inputs Left and Right					
Rotor speed = 324 rpm					
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Stability and Control Augmentation System	Trim Airspeeds
Clean	7210	4200	201 (aft)	ON and OFF	V for min pwr req'd V for max R/C V for min R/D $0.8V_H, V_H, V_L$
Heavy hog ^{1,2}	7490	5000	201 (aft)	ON and OFF	V for max R/C V for max R/D $0.8V_H, V_L$
Heavy hog ^{1,3}	9180	4600	200 (aft)	ON OFF	V for min pwr req'd $0.8V_H, V_H, V_L$ V_H, V_L
Heavy hog ^{1,2}	7620	15400	201 (aft)	ON OFF	V for min pwr req'd $0.8V_H, V_H$ V_H
Clean ⁴	8650	3700	199.5 (aft)	ON OFF	$0.8V_H, V_H, V_L$ $0.8V_H, V_H$

¹Rocket pod fairings removed.²Rocket pods empty.³Rocket pods loaded with rockets.⁴Landing gear cross-tube fairings removed.

Table 7. Longitudinal Controllability in Forward Flight.

Control Inputs Forward and Aft				
Rotor speed = 324 rpm				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean	6200	7610	190 (fwd)	V_{min} , $0.8V_H$, V_H , V_L V_{min} , R/D, V_{max} , R/C
Clean	5440	7780	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{min} , R/D, V_{max} , R/C
Heavy scout ¹	5000	9500	200 (aft)	$0.8V_H$, V_H , V_L V_{max} R/C
Heavy hog ¹	5060	7910	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{min} , R/D, V_{max} , R/C
Heavy hog ¹	5470	9490	200 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{max} , R/C
Heavy hog ¹	5530	7840	201 (aft)	V_{min} , $0.8V_H$, V_H

¹Rocket pod fairings not installed.

Table 8. Lateral Controllability in Forward Flight.

Control Inputs Right and Left				
Rotor speed = 324 rpm				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean	4270	7590	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{min} , R/D, V_{max} , R/C
Clean ¹	4070	7390	199.5 (aft)	$0.8V_H$, V_H , V_L
Heavy scout ²	5000	9500	200 (aft)	$0.8V_H$, V_H , V_L , V_{max} R/C
Heavy hog ^{2,3}	5180	8580	195 (mid)	V_{min} , $0.8V_H$, V_H , V_L V_{min} , R/D, V_{max} R/C
Heavy hog ^{2,4}	4030	8830	195 (mid)	V_{min} , $0.8V_H$, V_H , V_L V_{min} , R/D, V_{max} , R/C
Heavy hog ²	5270	9390	200 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{max} , R/C
Heavy hog ²	5290	7800	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{max} , R/C, V_{min} , R/D
Heavy hog ²	16150	7730	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{max} , R/C, V_{min} , R/D

¹Landing gear cross-tube fairings removed.

²Rocket pod fairings not installed.

³All rocket pods empty.

⁴All rocket pods fully loaded (1634 lb).

Table 9. Directional Controllability in Forward Flight.

Control Inputs Right and Left				
Rotor speed = 324 rpm				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Trim Airspeeds
Clean	7480	5900	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{min} R/D, V_{max} R/C
Clean ¹	8680	4330	199.5 (aft)	$0.8V_H$, V_H , V_L
Heavy hog ²	9280	6060	200 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{min} R/D, V_{max} R/C
Heavy hog ²	7640	4650	201 (aft)	V_{min} , $0.8V_H$, V_H , V_L V_{min} R/D, V_{max} R/C
Heavy hog ²	7640	16460	201 (aft)	V_{min} , $0.8V_H$, V_H

¹Landing gear cross-tube fairings removed.

²Rocket pod fairings not installed.

Table 10. Longitudinal Controllability in a Hover.

Control Inputs Forward and Aft				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
Clean	7670	610	196 (mid)	324
	7590	4460	195 (mid)	323
	8635	Sea Level	195.5 (mid)	322
	7370	8550	196 (mid)	324
	8560	4850	195.5 (mid)	324.5
	7750	10320	200.0 (aft)	324
Heavy hog	7590	730	201 (aft)	324
	9000	750	200 (aft)	324

Table 11. Lateral Controllability in a Hover.

Control Inputs Right and Left				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
Clean	7400	550	195.5 (mid)	324
	7420	4460	196 (mid)	324.5
	8550	7420	195.5 (mid)	324
	8480	4850	195.5 (mid)	324.5
	7660	10320	196.0 (mid)	324
Heavy hog	7420	850	201 (aft)	324
	8600	-160	196.5 (mid)	322.5
	8600	480	198.0 (aft)	323
	8780	030	200.0 (aft)	322.5
	8980	770	200.0 (aft)	324

Table 12. Directional Controllability in a Hover

Control Inputs Right and Left				
Configuration	Average Gross Weight (lb)	Average Density Altitude (ft)	Average Longitudinal Center of Gravity (in.)	Rotor Speed (rpm)
Clean	7170	560	195 (mid)	324
	7160	550	195 (mid)	313.5
	6980	570	195.5 (mid)	303.5
	7280	4580	195.5 (mid)	323
	7220	4580	195.5 (mid)	314.5
	7330	8550	195.5 (mid)	324
	8630	4790	195.5 (mid)	324.5
	7270	8550	195.0 (mid)	314.5
	8400	4850	195.5 (mid)	314.5
	7560	10320	195.5 (mid)	324
	7490	10320	195.5 (mid)	313.5
Heavy hog	7260	980	201 (aft)	324
	8460	-480	195.5 (mid)	323
	8600	060	200 (aft)	323
	8400	-490	196 (mid)	313.5
	8970	450	200.5 (aft)	324
	8770	Sea Level	200 (aft)	313.5

Table 13. Aircraft Reaction to Engine Failure.

Configuration	Gross Weight (lb)	Center of Gravity (in.)	Density Altitude (ft)
Clean	8500	Aft	5000, 10,000
Clean	8500	Fwd	5000, 10,000
Heavy hog	9500	Aft	5000
Heavy hog	9500	Fwd	5000
Clean ¹	7500	Aft	5000

¹Tests conducted with landing gear cross-tube fairings installed and with them removed.

APPENDIX IX. SYMBOLS AND ABBREVIATIONS

<u>Abbreviation</u>	<u>Definition</u>	<u>Unit</u>
ALT	Altitude	foot
AVG	Average	--
COEFF	Coefficient	--
CG, cg	Center of gravity	--
COLL	Collective	--
COND	Condition	--
CONF	Configuration	--
CPS, cps	Cycles per second	--
DEG, deg	Degrees	degree
DESCRIPT	Description	--
DIR	Directional	--
DWN	Down	--
FLT	Flight	--
FT	Feet	foot
FS	Fuselage station	inch
FWD, fwd	Forward	--
GRWT, grwt	Gross weight	pound
HQRS	Handling qualities rating scale	--
HP	Horsepower	--
IFR	Instrument flight rules	--
IGE	In ground effect	--

<u>Abbreviation</u>	<u>Definition</u>	<u>Unit</u>
in.	Inch, inches	inch
KCAS	Knots calibrated airspeed	knot
KIAS	Knots indicated airspeed	knot
KTAS	Knots true airspeed	knot
LB, lb	Pound, pounds	pound
LAT	Lateral	--
LEU	Leading edge Up	--
LN	Natural log	--
LT	Left	--
LONG.	Longitudinal	--
MAX, max	Maximum	--
MIN, min	Minimum	--
ND	Nose down	--
NU	Nose up	--
NO., no.	Number	--
PSI, psi	Pound(s) per square inch	lb/in. ²
REF, ref	Reference, referred	--
RPM, rpm	Revolution(s) per minute	rpm
RT	Right	--
SCAS	Stability and control augmentation system	--
SEC, sec	Second	--
SHP, shp	Shaft horsepower	--
SL	Sea level	--

<u>Abbreviation</u>	<u>Definition</u>	<u>Unit</u>
S/N	Serial number	--
STD, std	Standard	--
SYM	Symbol	--

<u>Symbol</u>	<u>Definition</u>	<u>Unit</u>
A	Rotor disc area	ft ²
C _T	Thrust coefficient	--
F _{LAT}	Lateral control force	pound
F _{LONG}	Longitudinal control force	pound
F _{DIR}	Directional control force	pound
H _D	Density altitude	foot
H _P	Pressure altitude	foot
i _t	Horizontal stabilizer position	degree
R	Rotor radius	foot
R/C	Rate of climb	ft/min
R/D	Rate of descent	ft/min
V _{cal}	Calibrated airspeed	knot
V _H	Maximum airspeed for level flight	knot
V _L	Limit airspeed	knot
%	Percent	--
α	Angle of attack	degree
β	Angle of sideslip	degree
δ _{COLL}	Collective control position	inch

<u>Symbol</u>	<u>Definition</u>	<u>Unit</u>
δ_{DIR}	Directional control position	inch
δ_{LAT}	Lateral cyclic control position	inch
δ_{LONG}	Longitudinal cyclic control position	inch
ζ	Damping ratio	--
θ	Angle of pitch	degree
$\dot{\theta}$	Pitch rate	deg/sec
$\ddot{\theta}$	Pitch acceleration	deg/sec ²
ρ	Air mass density	slug/ft ³
ϕ	Angle of bank	degree
$\dot{\phi}$	Roll rate	deg/sec
$\ddot{\phi}$	Roll acceleration	deg/sec ²
Ω	Rotor rotational frequency	rad/sec
ψ	Yaw attitude	degree
$\dot{\psi}$	Yaw rate	deg/sec
$\ddot{\psi}$	Yaw acceleration	deg/sec ²
ω_d	Damped natural frequency	cycle/sec
ω_n	Undamped natural frequency	cycle/sec
P	Period of oscillation	second
X	Amplitude	inch
m	Number of half cycles	--
$<$	Less than	--
$>$	Greater than	--

Subscript

Definition

a	Ambient
std, s	Standard
t	Test

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13. ABSTRACT The Phase D, Part 1 airworthiness and qualification handling qualities tests of the AH-1G helicopter were conducted at Edwards Air Force Base, California, and auxiliary test sites during the period 13 June 1968 through 29 July 1969. Handling qualities were quantitatively evaluated to determine model specification compliance and to obtain mission suitability information for inclusion in technical manuals and other publications. The AH-1G met all contractual requirements of MIL-H-8501A except for paragraphs 3.2.4 (cyclic force gradients), 3.2.7 (cyclic breakout forces), 3.5.4.1 (takeoff and landing in winds), 3.5.5 (autorotational entry) and 3.5.5.1 (aircraft reaction to engine failure). Tests were not conducted to verify compliance with paragraphs 3.5.4.3 (autorotational landings), 3.5.4.4 (autorotational landings) and 3.5.4.5 (autorotational landing with flotation gear) of MIL-H-8501A. By contractual agreement, the handling qualities requirements presented in paragraphs 3.3 (directional and lateral handling qualities) and 3.6 (handling qualities during instrument flight) of MIL-H-8501A were not applicable. The handling qualities of the AH-1G are acceptable throughout the flight envelope except for the four deficiencies for which correction is mandatory for mission accomplishment: excessive cyclic control breakout forces; inadequate directional control; inability to achieve maximum tail rotor blade angle (19 deg) when full left directional control is applied for all conditions with the present directional control/yaw SCAS geometry; and excessive tail rotor horsepower required for hovering and translational flight. In addition, there were five shortcomings for which corrective action is desirable.			

DD FORM 1473

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Security Classification

14.	KEY WORDS	LINK A		LINK B		LINK C	
		ROLE	WT	ROLE	WT	ROLE	WT
	AH-1G helicopter Phase D, Part 1 Handling qualities						

UNCLASSIFIED

Security Classification